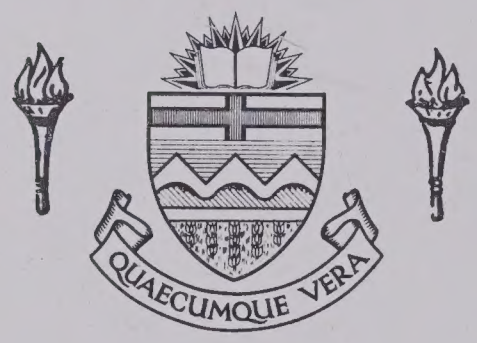

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THE UNIVERSITY OF ALBERTA

SIMULATING INTERNATIONAL CONFLICT: INCREASING MILITARY OPTIONS AVAILABLE TO DECISION-MAKERS IN INTER-NATION SIMULATION

by

Lorne Gary Yacuk

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

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OF MASTER OF ARTS

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled: "Simulating International Conflict: Increasing Military Options Available to Decision-Makers in Inter-National Simulation" submitted by Lorne Yacuk, in partial fulfilment of the requirements for the degree of Master of Arts.

ABSTRACT

This work focuses on the military subsystem of Inter-Nation Simulation (INS). The purpose is to identify some of the major defects of this subsystem and to suggest modifications to the structure and operation of INS in order to correct such weaknesses. This is pursued by defining "simulation", reviewing the development of simulation, and examining the advantages in applying simulation to the study of international relations.

Following the review of simulation as a technique, the military establishments of real world nations are investigated. It is proposed that such organizations carry out three prime function, namely, coercion, the application of force and internal control. Defects of INS and corrective innovations are treated under these three categories.

The broad defect considered under the coercive function is the lack of viable options available to INS decision-makers with regard to the use of the military for measures short of war. Thus innovations regarding alliances, espionage, propaganda, the movement of conventional forces, mobilization and blockades are introduced.

There are two major weaknesses under the application of force: the certainty of knowing the outcomes of battle before forces are committed and the lack of distinction between the use of nuclear and conventional forces. To correct these defects it is suggested that calculation of battle outcomes be probabilistic and that operating rules

regarding occupation and colonial warfare be introduced in order to provide distinctive ends with regard to the use of conventional forces.

Finally, it is noted that the revolution process of INS is a passive activity barring participation by INS players. Since foreign intervention in domestic crises is precluded in INS, the revolution process is fundamentally changed into an active operation allowing civil wars and coups d'etat (and consequently, foreign power interference).

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INTRODUCTION

The use of simulation in the study of international relations has gained increasing attention in the past decade. Such attention was largely stimulated by the ground-breaking efforts of Harold Guetzkow and associates who developed Inter-Nation Simulation (INS) at Northwestern University during 1957-59.[1] Since the development of INS other universities and institutions have explored simulation as a teaching and research device.

The Political Science Department at the University of Alberta began in 1967 using INS as a teaching aid in its introductory course on international relations. In the 1969-70 term the research possibilities of simulation were first explored. After observing numerous exercises as Simulation Director it became apparent to me that INS, as presently structured, contains a number of defects. Equally apparent was the awareness on the part of INS designers of these faults (much of their recent publications deals with their testing and correcting the model)[2] and their intention that teachers or researchers using INS should seriously consider revising it. As stated in the Instructor's Manual, "It is hoped that the present formulation will not inhibit innovations in the structuring or operating of the INS".[3]

My aim is to accept the invitation by identifying the defects of the military subsystem of INS and suggesting a number of modifications that could overcome such weaknesses. For the purpose of this work the other two subsystems of INS - - - the economic and political - - - are accepted in their present form and alterations to these sectors will only be

undertaken if these crucially bear on the military subsystem.

There is an inherent danger that an expansion of the military subsystem will result in an imbalance between it and the other two sectors. Thus large scale research using such a revised model should await a similar treatment of the economic and political components of INS. However, if the proposed revisions are introduced with care and moderation the resulting imbalance will not be so exaggerated as to preclude useful research which focus on problems of a military nature in international relations. The question of how to properly introduce innovations is more widely treated later.[4]

Another aspect of this effort that should be stressed is its technical nature. The abbreviations and technical terms of INS are used throughout. Thus I assume a familiarity on the part of the reader with the Participant's Manual and the Instructor's Manual of INS. However a similar knowledge of the development of simulation as applied to the study of international relations is not assumed. Consequently the first three chapters are devoted to providing a brief background of simulation. Each chapter answers a basic question: what is simulation; why was simulation developed; and how is simulation used. My reasons for adopting what can be called the innovative approach and the practicality of innovating are the subject matter of Chapter Four. Having established this foundation the next four chapters review the major defects of the military subsystem and my proposals. In Chapter Five it will be suggested that the military carries out three major functions; these, in turn, become the following three chapter titles. Thus the innovations are ordered under the headings of the coercive function, the application of force, and internal control. Finally a brief summary and discussion of future

prospects is provided.

A comment on the nature of the innovations is necessary. It is not my intention to rewrite the Manuals. Rather the innovations are offered as major guidelines for modifying the structure and operation of the military subsystem. As such, the principle features of the revisions are discussed, not the actual operationalization - - - that is the actual operating rules as they would appear in the manual. However, since some of the revisions have actually been incorporated in exercises conducted at the University of Alberta, examples of innovations are offered in the appendices.

Finally, the preliminary nature of this work should be stressed. My efforts here are a first step in my plan to eventually use simulation to study certain international problems regarding conflict. But before I undertake such research I must be confident that the research technique I employ will yield realistic and useable results. It is obvious to me that in its present form INS generates many nonisomorphic[5] results and has limited applicability. This work, then, is the initial stage of looking toward a more workable simulation exercise. I record obvious defects and the way in which these faults can be corrected. It remains my task in the near future to place a similar focus on the economic and political subsystems. When all innovations have been introduced the revised model will undergo rigorous testing in order to evaluate the effects of the proposed improvements. If the new model proves satisfactory it can then be applied to research in international relations.

CHAPTER I

WHAT IS SIMULATION

Definition

The literature on simulation yields numerous responses to the question, what is simulation. I prefer Richard Dawson's definition:

> "Simulation, as a social science research technique refers to the construction and manipulation of an operating model, that model being a physical or symbolic representation of all or some aspects of a social or psychological process. Simulation . . . is the building of an operating model of an individual or group process and experimenting on this replication by manipulating its variables and their interrelationships."[1]

This definition was chosen since it suggests three essential elements of simulation. These features are:

(A) Reproduction.-- A simulation always refers to a real system or process which it purports to represent. The simulation need not be identical to the referent system in all respects but it must operate like the real world in the respects that are relevant to the study at hand.[2]

(B) Simplification.-- Since simulators are not reproducing every feature of the referent system they attempt to replicate the "central features of reality".[3] Simulators reproduce only those characteristics of the system or process under observation that they consider necessary for explanation or prediction. Simulators can simplify the number of variables by allowing one prototypic feature to stand for many features of the real world; by allowing one property to stand for another; and by substituting a single probabilistic feature for many functions in the

real world.[4]

(C) Dynamic.-- This simplified representation of some real world system or process is meant to operate. This feature distinguishes simulations from other types of models (verbal, iconic and mathematical). Once the simulator establishes the initial parameters or inputs of the exercise, simulations can function indefinitely; the outcomes generated at one point become the inputs for the next phase of the exercise.[5] In this respect simulations can be called self-organizing systems.[6]

Dawson's definition also points out another important aspect. The term "simulation", in general, refers to a technique while "a simulation" means a particular model such as INS. The distinction becomes clear if the main critique and comments about the two usages are understood.

When "simulation" means a technique used to investigate questions about social or psychological processes the main question is whether such a method can validly be used to provide information about the referent system. Hence discussion is fundamentally methodological in nature. Can links be shown between the abstract model and the real world? To what type of questions is the technique most appropriately applied? At what level of analysis is the method working?

A different set of concerns apply to a simulation when it means a model. The legitimacy of using the technique is assumed. The central focus is how well the model replicates the reality it purports to represent. The simulator who has designed a model has, in effect, expressed his own theory about the composition and functions of some real system or process. He has defined the features he thinks are important and has suggested how these components interrelate. To complete his model he may establish the initial parameters. Thus important questions are:

Are the variables sufficient to adequately explain the phenomenon? Are the relationships correctly stated? Are the parameters realistic?

Types of Simulation

Simulations can further be categorized into three types: computer, man-machine, and all-man. Some writers reserve the term "simulation" to refer only to the first type.[7] I adopt Dawson's suggestion that "simulation" is a generic term covering all three categories.[8]

The essential feature of computer simulations is that all aspects are programed. That is, all variables, interrelationships and decisions are explicitly expressed in a computer program.[9] The simulator feeds in the initial parameters and the machine generates the outcomes. The decision making behaviour that comprises part of the program is hypothetical; the objective is to see what would happen if this assumed behaviour were the actual behaviour (other things being equal).[10]

In man-machine simulations (often called gaming) actual human beings make the decisions. These simulations are mixtures of freely made decisions within the framework of some explicitly programed rules.

> "An elaborate physical, symbolic, and temporal environment is created to represent major aspects of the system . . ., and a human player is placed in that environment. He then enacts the role of the human being, or group of human beings, who normally interact with the real environment being simulated."[11]

This environment provides the limits of action or acts as a restraint on the decision maker.

All-human simulations (also called crises games and scenarios) are characterized by the absence of any explicitly defined restraints on action. Permissibility of a player's move is limited by the judgement of an expert group of umpires. In each case that a player makes a decision or attempts an action, the umpires rule whether such a move is credible

and they determine the effects or outcome of the move. Such simulations are usually directed at generating and evaluating different strategies or policies with regard to a particular problem.

Three other terms often appear in simulation literature and occasionally are erroneously confused with "simulation". They will be defined here to show the distinction.

Monte Carlo is

> " . . . a computational method or technique of introducing data of a random or probabilistic nature into a model. Its purpose is to reproduce data in the same manner as would occur in a real life situation."[12]

This technique is heavily used in simulation as a means of simplification. For example, in international simulations a domestic process such as the change in office of the head of state can be simplified through the Monte Carlo method. A single computation (in which the probability of office holding is calculated and compared to a random number table) replaces the total process. This approach introduces probabilistic changes in office in as realistic a manner as would occur in the real world.

Game theory is most often confused with simulation because of a similarity in terms. However the former is a distinct branch of study which utilizes mathematical models to determine the optimal strategies under conditions of conflict of interest.[13] "Players" compete against each other, each participant fully aware of all alternatives available to him and his opponent. Each player is assumed to be rational, that is, he will "seek to maximize his utility".[14] Varying degrees of communication are permitted between contestants but these are well defined before bargaining and remain constant. Under these conditions the best strategy (i.e. the moves that lead to the most desirable balance of payoffs to contestants) can be calculated.

The prescriptions derived through game theory are interesting and may have relevance to real world decision making. However the major drawback of game theory is that the prerequisites that can be imposed in the laboratory are usually not operative in the international system. Real decision-makers face limitations of time and human durability. They may not be able to review all the alternatives available to them. They can not always assume that their opponents are rational. The level of communication varies between decision-makers and from time to time in the international system. Thus

> "Though statesmen . . . often believe that they are 'optimizing' their strategies . . ., they actually only . . . pick the most acceptable strategy among the few alternatives they can survey within the time and resources they can or will spend on the search."[15]

Since simulations are not bound by the basic prerequisites necessary to game theory, the former can generate the broad range of non-optimal but probable and realistic strategies that occur in the real world. To be explicit there need not be a condition of conflict in interests in order that simulations produce results. No assumptions about the rationality of players need be drawn. Information passing between participants can vary. All options need not be reviewed. This is not to say however that simulation is superior to game theory. The two approaches are simply aimed at achieving different purposes. The insights gained through both approaches are highly complementary.[16]

The final type of activity often confused with simulation can be called <u>model organizations</u>. Such pedagogic endeavors as model parliaments and model United Nations appear similar to simulation but differ fundamentally. Model organizations are replications of the functions of a referent organization with the objective of providing role-playing exp-

erience for participants. They are not analytical models in the sense that the variables and interrelationships have been precisely defined. Hence they cannot be manipulated for experimental purposes. The prime concern in designing a model organization is to capture the form of the referent system in order to offer an individual experience to players rather than to reproduce the fundamental elements so that these can be analyzed.

The Origins of International Simulations

To this point simulation has been defined and distinguished from similar activities. As a final step toward understanding the concept, it is useful to review the origins of the current games that are devoted to the study of international relations. Such simulations grew primarily from two sources - - - the wargame and small group laboratory studies.

Wargames have a long history but relevant developments occurred in the past one hundred years.[17] From a rigid game with formal and elaborate rules developed the more flexible Kriegspiel. The major innovation of the latter was the introduction of free play for the participants. Rather than having every move bound by explicit rules as in the rigid game, Kriegspiel players could attempt strategies that were not covered in their manuals or rulebooks. A panel of judges ruled on the permissibility of such moves (similar to the crisis games of today). These Kriegspiel games were used as quasi-experiments to develop new military approaches and to predict the outcome of war.[18] From an initial narrow focus on the tactics of a battle, Kriegspiel games were broadened to investigate the larger problems of strategy. From this development it was natural that some gamers would suggest that many important aspects of grand strategy could not be explored unless political considerations were accounted for; hence

the advent of the diplomatic-military game. Such games were widely used as aids in the development of government policy. For example, in 1929, Erich von Manstein created a political game to assess German policy vis-à-vis Poland. Similarly the Japanese Total War Institute, established in 1940, used political-military games to predict the responses of leading Pacific powers to Japanese expansion.[19]

The impetus for using diplomatic-military games moved to the United States after the Second World War. For example, the Rand Corporation conducted an extensive series of such games in 1954 and similar research activities were adopted by several universities, notably Massachusetts Institute of Technology.[20] The main objective of these efforts remained the study of military strategies.

The advances made in wargaming techniques stimulated thinking about the development of a strictly international game; one that could be oriented toward political phenomena between states. Researchers at Northwestern University under the direction of Harold Guetzkow conducted pilot runs of an international simulation in 1957-58.[21] Similarly, Oliver Benson proposed a simple computer simulation in 1959.[22] Such simulations did not eliminate war; rather the emphasis had shifted to the study of a broader range of international interaction including political, economic and military.

While war games provided the inspiration for constructing international simulation, the pioneers in this field encountered numerous methological problems. Thus simulators drew on the experience gained by social psychologists working on small group experiments. Insights were provided on such problems as the observation of behaviour, the collection of data and the application of small group results to a larger population.[23]

With the increased activities in international simulation in the 1960's, knowledge from many other disciplines has been incorporated into simulation models. For example, simulation studies have benefited from the infusion of such approaches as decision theory and systems analysis. Similarly simulations carried out in the fields of economics, business psychology, sociology, anthropology, law and education have provided useful material for international games.[24]

CHAPTER II

WHY SIMULATE

Some Research Problems in International Relations

As concern grew for a scientific methodology in the study of international relations,[1] simulation was developed with the expectation of overcoming certain research problems. Such problems arose fundamentally because of the nature of the subject matter; the international system offers few opportunities to the researcher to carry out repeated experiments, data is difficult to collect and in general international relations are often too complicated to analyze using simple, manageable models. In many respects, simulation resolves these difficulties.

Essential to any concept of empirical investigation is the idea that experiments should be capable of being repeated. The social scientist studying international relations has no control over his subject matter. He is dependent upon "natural" settings but often finds that these occur too infrequently to be statistically significant. Consequently the researcher is limited in the number of applicable conclusions he can draw.[2] His dilemma is accentuated since often he can find no historical counterpart at all for questions he is likely to investigate. For example the researcher may be interested in the effects of an expansion of the number of nations possessing nuclear weapons but is precluded from experimental research since such conditions have not yet occurred.[3] Through simulation, the social scientists can replicate the conditions he desires to study and carry out repeated exercises starting from the

same initial parameters until his results are statistically significant.

Another problem that simulation attempts to overcome is the lack of sufficient, adequate data. Relevant data are frequently unobtainable because of inadequate recording of events. Moreover, even if the data do exist, they are classified by governments and inaccessible to researchers.[4] Simulations can generate data of the type that is useful to social scientists.

Also, in analyzing natural settings the latter are found to be too complex to be summarized in a form which would be amenable to "existing analytical techniques".[5] The simplified simulation model, by definition, retains the central features of the natural setting expressed in a more manageable and easily observable form.

Even if these mentioned roadblocks to research were to be overcome, the cost of investigation in terms of time, money and energy would often be prohibitive. The ability to compress time and to build a simplified model that requires less money and energy than natural experiments increases the appeal of simulation.

Finally, many researchers felt the need for quick insights into novel problems that had "no apparent counterparts in prior experience".[6] The outcomes of simulations, even if not conclusive, can be highly suggestive of solutions to problems.

Advantages of Simulation

While simulation was originally intended as an appropriate means of overcoming some pressing research problems, in using the technique many researchers discovered further advantages. Many of these do not necessarily resolve methodological questions, but do enhance the use of the approach.

Simulation is an excellent organizing and consistency-checking

device.[7] The very process of designing an exercise requires that the simulator be specific and precise in the definition of his variables and relationships. Intuitive or vague assumptions soon become glaringly apparent and require precise expression.[8] Often a similar expression of ideas through other types of models, especially verbal, do not place such rigid, inherent demands on the model-builder.

Simulators also found that when investigating complex operations, simulations often could be used to assess the relative importance of some variables and relationships; this knowledge guided the researcher to more vigorous experimentation and consequently a successful reformulation.[9] In serving this function, simulations can be repeated while one variable is manipulated, the others remaining constant. The different outcomes generated provide evidence about the significance of the variable under observation to the whole system. This manner of investigation can be extended to observing the effects of a change in a stated relationship, or a whole subsystem can be significantly altered to assess the impact on other subsystems.

Simulation also provides a useful vehicle for briefing, that is, the presentation of a "total picture" in a relatively short time.[10] Observers of an exercise see a complex system in action and can extract a large number of simultaneous perceptions of this complicated system. Thus simulations are often used "to gain enthusiasm or acceptance of an idea".[11] This is particularly true if the person to be convinced actively participates; the involvement and excitement generated during exercises frequently develops the favourable attitude being sought. For example, in my experience I have discovered that students are more willing to undertake a penetrating study of international concepts once they have partici-

pated in a simulation. By observing how these concepts are interrelated they more readily pursue their studies.

Another advantage is that simulation was discovered to be complementary to other methods of investigation and the outcomes of exercises often held import for other research questions.[12] Thus the results from simulation may corroborate other findings, strengthening the conclusions provided by other analytical techniques. Often the results achieved in a simulation study of a particular problem may be suggestive of solutions to other questions or may indicate directions of research in other studies.

The heuristic value of simulation should be stressed. "The systematic probings of experimental explorations ought to yield the unexpected as well as substantiate the familiar."[13] Used in an exploratory fashion, exercises often reveal unforeseen methodological difficulties and can reveal unanticipated or underrated characteristics that influence a system.[14]

A final advantage of the use of simulation is that it makes generalists out of specialists.[15] In designing an exercise to accommodate a specific research question, the investigator is required to develop a broad understanding of the system in which his particular concerns occur. The simulator must regularly draw back from his specialized interests and view systems or processes from a wider perspective. While this pressure, in itself, does not guarantee superior research, it increases the probability that the researcher will not be reaching conclusions based on too narrow a focus.

CHAPTER III

HOW IS SIMULATION USED

Teaching with Simulation

The two broad purposes of simulation are research and teaching.

> "Formidable research advantages notwithstanding, simulation's greatest advantage today be may (sic) pedagogic."[1]

The teaching aspect has two functions - - - learning and training.

As a vehicle for learning, simulation can be used to overcome some structural defects in the present education system.[2] The first defect that educators point out is the mismatching of time. In most cases students are presented with information that to them is not applicable to their current life situations. The material may be of use to them in the future, thus the pupils have difficulty in appreciating the relevance of the material being taught. Next, the often involuntary, enforced character of curricula frustrate students. Discouraged by the fixed standards of the classroom, the student may wish to learn at his own pace, seeking motivation and rewards from his peers rather than from an adult. This dual role of the teacher as both instructor and judge is the third defect. By giving grades that can affect a student's future, attitudes such as hostility, servility or alienation may develop which can interfere with the learning process.

Simulation, to varying degrees, can resolve these problems. Even though a student acts in a simulated environment rather than the real world, the student can immediately employ and test knowledge he has

gained in the classroom. In games that admit a large amount of free play, the student is unhampered by conventional classroom restrictions. Each pupil can develop strategies within the game suited to his own capacities and can realize a sense of accomplishment based on his own measurements (rather than competing against other students of varying abilities on the same classroom assignment). Finally, in interacting with fellow students, a person is responsible to those students for good performance rather than the teacher. The teacher is not the judge in this situation; by interacting with others in the game, the student and his peers become judges of performance.

Beyond resolving teaching problems several other claims are made for simulation as a teaching device:[3]

Simulation may inspire the student to more sophisticated inquiry. The post-exercise reflections are of great importance when the student critically questions the model he has used. Also the experience may prompt him to deeper investigation of the subject matter of the simulation.

Students may more easily grasp a complicated system or process. The simplified version of real phenomena allows students to handle fewer variables. This is not to say, however, that the simulated environment is no longer complex. One reoccurring response from participants is that they realize the interrelatedness of variables and lack of simple solutions to international problems.[4] Simulation has the advantage of reducing phenomena to a manageable level while retaining striking complexities.

Participants can also develop special skills - - - communication, bargaining, etc. - - - during simulations. This often has the effect of increasing a student's confidence that he can appreciate and control

real life situations utilizing the newly acquired skills. Associated with this confidence building aspect is the information-retrieval function of simulation. Simulation allows a participant to bring into consciousness, knowledge he already had but was unaware of.

Finally students may learn through experience some of the specific problems and goals of nations. Depending upon the actual events being simulated the student may develop a better perspective on the strategies of nations other than his own. For example, students may become more sympathetic to the special problems faced in underdeveloped nations if they acted as a decision-maker in such a simulated country.

The second teaching function is training. In the acquisition of a skill the prime requirement is practice.[5] For obvious reasons it may not be feasible to practice useful international skills in the real environment. Thus simulations are a useful device for policy makers (and students who eventually wish to enter government) in developing talents under conditions that do not have immediate and perhaps harmful consequences for the real world. For example, decision-makers often design contingency games based on hypothetical (but possible) crises. They can develop their crises management skills, establish a familiarity with possible situations so that they would not panic if such emergencies occurred, and they can follow a strategy to its fullest extent in order to assess all its effects. Thus poor strategies which fail to achieve the policy maker's purpose or could lead to uncontrollable events such as war can be discarded. In short, this "dry run" function of simulation offers the ability to make mistakes without disastrous effects to the world and to gain practice at resolving emergencies.[6]

Research Activities with Simulation

The second major use of simulation is social investigation. There are several types of research to which simulation can profitably be applied. The foremost activity however is theory building.

> "There exist few adequate theories in political science, if by 'adequate' we mean relevant variables are agreed upon and defined in operational terms and that relationships among variables are stated in relatively unambiguous terms."[7]

One of the chief reasons for inadequate theories is the lack of empirical research and data from the real world upon which the theory can be based. Since, as discussed, the nature of the subject matter makes such research and collection of data difficult, simulation offers an alternate means for making sense out of reality. There are two stages in which simulation is useful in theory-building.

First the very construction of a simulation is an exercise in model building. The simulator is required to identify major components and relationships and express these clearly and precisely. However, simulation's major contribution is that it offers the theorist the ability to manipulate and assess his model.

> "The advantage of simulation techniques in theory-building and testing are summed up in the idea of 'control'."[8]

By focusing on one or two variables while holding the rest constant, the researcher may be able to evaluate the effects of those variables. By continually adjusting his original model he can develop a simulation that explains more real phenomena or explains them better. By consistently being critical of his model the simulator may discover more factors that should be accounted for in an adequate theory. Simulation can be self-correcting in the sense that variables and relationships that are con-

structed incorrectly usually generate unreasonable or improbable results. Often critical investigation of this "poor" model will indicate at what point the mistake is occurring and the contributing variables.

This process is useful when applied to established theory. That is, the technique of simulation need not be used to construct a whole new theory, but may be applied to improve theory that is already entrenched in the discipline. Exercises may be designed to accommodate verbal or mathematical theory. After repeated runs, the consequences of that theory may be generated to see if the theory actually explains (or predicts) what it claims to explain.

The fact that simulations can be used to generate the consequences of a theory makes it useful in another research function, namely, theory-comparing. Competing models of international relations may be simulated and the results of each compared. From this collation the strengths and weaknesses of each theory can be assessed. Furthermore we may be able to determine in which cases one model is more relevant than another.

Another important end that can be pursued through simulation is hypothesis-testing. In simple terms, the researcher develops an "if . . . then" proposition. Rather than awaiting the "if" conditions to occur in the real world, he can replicate them many times through simulation. The exercises generate data by which he can assess the degree to which the "then" conditions followed.

Research may also be directed toward policy planning. Simulation can be used for detailed examination of a strategy or group of strategies.[9] Information can be gathered regarding the probability distribution of the outcomes of different strategies.[10] Thus the decision-maker can assess the likely consequences of choosing the alternatives available

to him. It should be emphasized that simulations will not realistically predict a specific event. Rather it can be used to predict the probability of certain patterns of events occurring in the real world. For example, if simulation were used to study the patterns of alliance deterioration, it could not reasonably predict that a specific nation would withdraw from a defense agreement; however, it could reveal that given certain conditions one would expect an alliance to become less cohesive. If such conditions occurred in the real world the policy maker is forewarned of the probable consequences and can plan accordingly.

Another research undertaking for which simulation is particularly suitable is to investigate the impact of idiosyncratic factors in decision-making. The components of this variable such as personality, attitude, values, and socialization of real world policy makers can rarely be measured directly. Laboratory experiments in the disciplines of sociology and psychology, while having directly measured personality and attitudes, have not been effectively applied to decision-making in the context of international affairs. Simulations, in part, can fill the middle ground by the direct measurement of idiosyncratic factors among students who are acting in situations similar to real international events. It offers us an ability to utilize information on the relationship between idiosyncratic and systemic features influencing decision-making.

Finally, simulation has been used to study relative utopias or valued futures.[12] These are future states or conditions of the world. The researcher designs a simulation based on a system that has not existed (but could possibly come into existence) and studies the consequences generated. For example, a study was undertaken to explore the changes in the "cold war system" if the number of nuclear powers were increased.[13]

The prime research activities in which simulation can be used have been described. The experimental possibilities may be unlimited and any research problem may be within the scope of the technique. However, before simulation gains wider use as a research tool, certain limitations must be overcome.

CHAPTER IV

THE CASE FOR THE INNOVATIVE APPROACH

Simulation as a Developing Technique

The growth of and advantages in using simulation in the study of international relations have been reviewed. Needless to say a technique does not appear in a discipline full blown and complete; simulation is no exception since various limitations and defects have been identified and discussed over the past decade.[1] It is beyond the scope of this work to review the debate on the validity of using simulation as a research tool, however a few comments are in order.

The main and ". . . most vigorous criticism of simulation is that it is so 'artificial' as to be grossly 'unrealistic' ".[2] In brief the argument runs that the very process of designing a simulation model - - - simplifying and reducing, assigning values to certain variables, substituting one property for another, etc. - - - preclude isomorphism. Important variables are left out, meaningless numerical values are given to nonmeasurable characteristics and distorting influences are introduced into the model. In short, no real connection can be shown between a simulation model and the referent system it purports to represent.

Such arguments, however, must be placed in perspective. Many of the limitations credited to simulation are not unique to that approach. If simulation is viewed as one of many methods used for social investigation it can be noted that the criticisms leveled at simulation plague social research in general. All model building is selective; all modes

of analysis face the dilemma of determining what can or cannot be quantified; and, all experimental research encounters the risk of introducing influences that jeopardize results and conclusions. "Thus, in many ways the design of a simulation involves the same set of problems as does any attempt to bring order out of the confusion of the real world."[3] Since these problems have not been satisfactorily resolved in conventional means of inquiry, much of the criticism of simulation appears unduly harsh and unwarranted.

Moreover, there is a more pressing reason why such criticism is unwarranted. The application of simulation to social research is in the developmental stage. Simulators do not claim their models are complete and adequate for penetrating research. Indeed the tenor of the writing of simulators is just the opposite; they often go to great lengths cautioning the readers that more and more careful study and testing of the technique is required. For example, Harold Guetzkow admits that no rigourous guidelines were used in formulating INS. Rather the designers relied upon their extensive knowledge of the scholarly literature concerning international relations. He then suggests:

> "It is important that a firmer embedding of our model within the studies of international relations be attempted, so that an almost total reliance upon an intuitive grasp of this literature may be circumvented."[4]

Such close examination of simulation with the goal of testing, modifying and improving its performance has been the pursuit of many simulators.[5] Thus some of the critics who reject simulation as a valid approach are somewhat premature in their conclusions. They are rejecting a technique that is still in its infancy, a method in the initial stages of development.

Here, then, is the crux of the matter for simulators. Once a model is prepared it must undergo strenuous operation and observation. The

outcomes generated by the model must be carefully assessed in order to determine whether they are realistic and useful. Charles Hermann suggests that in the early stages of developing a model a useful procedure for improving simulations is to subjectively evaluate the outputs (i.e. face validity test) and provide alterations that seem necessary.[6] Such an approach is a tremendous time saver in that the researcher need not look for independent data to demonstrate that certain outcomes are unrealistic. In many cases results are obviously nonisomorphic. Thus adjustments are made to the model until at least on the subjective level the outcomes no longer offend common sense.

To take an example, in numerous INS runs I have observed, the rate of increase of nuclear weapons is typically over 100% per year. A simulator need not go to great lengths in terms of time and cost in arming himself with hard data about actual rates of increase of real nuclear powers to conclude that the simulation exercise is producing inaccurate results. It is useful as a preliminary step to more strenuous testing of the model to introduce modifications based on purely common sense evaluation of the simulation.

This, then, is the objective of the present work - - - to examine the military subsystem of INS, to identify the major defects and to suggest a number of innovations which will overcome these weaknesses.

The Practicality of Innovating

In introducing a large number of innovations it may be argued that the addition of new variables and operating rules will require too many new calculations and operations by the participants, thereby making the model too complex and cumbersome. Indeed a brief overview

of the suggestions in later chapters may give this impression. Thus it is important to make explicit the manner in which I think the modifications should be introduced.

First, it is not expected that all the innovations will be introduced in a given run. In fact some of the suggestions are mutually exclusive and represent alternate ways of overcoming a defect. It is expected that a few innovations , those that are relevant to the simulator's purpose, can be incorporated into an exercise. If his goal is to teach or investigate a particular problem such as foreign influences in civil wars and he finds the present formulation of INS inadequate, he may wish to refer to the innovations regarding the internal control function of the military so that he can at least replicate a civil war - - - a choice that at present the INS does not offer him.

A second factor in favour of introducing variables is the increasing use of computers and calculating machines in simulation. The requirement that participants undertake more operations in INS can be compensated for by providing machines for high speed computations of these purely arithmetic functions.

Another factor easing the burden on the players will be the introduction of a major innovation - - - a new role called the Official Military Advisor. One of his major functions will be to ease the burden of the new calculation duties required by some of the other innovations.

Still another means of making innovating practical is to introduce extensive new rules and variables only when using experienced players. That is, the present formulation of INS can serve as an introductory game and as the participants master the current calculations a more comprehensive model may be offered to them.

Finally, it will be noted that some of the suggested changes actually reduce the number of rules, equations, and variables. With these reasons in mind then, it remains now to examine the military subsystem and improve it.

CHAPTER V

THE MILITARY SUBSYSTEM

Functions of the Military

It is characteristic of modern nation states to maintain permanent military establishments even in time of peace.[1] These organizations carry out three basic functions in the state. First, traditionally the military's prime function is to achieve national goals through the application of force, that is, to obtain a military victory in time of war. Cases of nations applying force range from ". . . aggressor nations who seek expansion . . . to peaceful nations who only fight for self-preservation".[2] However, actually going to war can be costly to the victor as well as the defeated. Especially with the advent of nuclear capabilities it is uncertain that going to war will accomplish anything but planetary destruction.[3] Thus increasing attention has been focused on the second function performed by the military - - - the potential to inflict destruction and pain. This function manifests itself in coercive diplomacy, the armed forces providing the basis by which to threaten, intimidate and blackmail.[4] National objectives are pursued through the expression of intention to use force and may be attained if the threat is viable; if, at the very least, the threatener does possess the means (an armed force) to carry out his threat.

While the first two functions are oriented toward achieving and preserving external objectives, the military also has performed the third domestic function of internal control in extraordinary circumstances in

which the civilian police forces can not cope with home problems.[5] Such a function can range from simple mobilization for controlling demonstrations to putting down extralegal attempts at seizing governments (although such a function has not always been successful; at times the military itself is the instigator of an illegal attempt to seize control).

It should be emphasized that these functions are not carried out to the same degree in all nations. For example, a developing nation with a small armed force may use it almost totally for internal control while a large industrialized nation would place greater emphasis on the military as an instrument of foreign policy. While these functions are not exhaustive[6] for the purposes of this work they cover the majority of cases concerning relations between nations. Thus the three functions provide a convenient means of categorizing innovations to INS and form the chapter headings for the next three sections. While this is the case, there are two innovations which encompass all three functions, namely, the Official Military Advisor and geography. These will be treated first.

The Official Military Advisor

In modern nation states military establishments play an important role in policy making. Not only do these establishments develop broad national military strategies such as the German Schlieffen Plan or France's Plan 17 in 1914,[7] but by their nature military establishments exert a specialized influence or pressure on policies other than those purely military. For example, military leaders compete with other sectors of the national economy for resources to maintain and develop the armed forces; the extent to which they are successful has consequences (fewer remaining resources) for other national programs. Since there is an

ill defined line between strictly military matters and political affairs, the advice of the military establishment often has a significant effect on a nation's foreign and domestic policy.[8] (For example, the military can be highly influential in determining which nations will be chosen as alliance partners.) The range of military involvement in political affairs even goes to the extent of seizing government and establishing all national policies as is characteristic of many developing countries.

Thus in simulations that investigate problems dealing with the military subsystem it is imperative for the sake of isomorphism to effectively represent the role of the military establishments of nations. Following standard design procedures, one prototypic decision-maker called the Official Military Advisor (OMA) can be created to represent this complex establishment.[9] This role would represent groups such as the Joint Chiefs of Staff, Secretary of Defense, and veterans' organizations. The prime concern of the OMA is national security and encompassed in this concern are some or all of the following duties:

(A) Participation in National Council (NC) Meetings.-- As do the other decision-makers, the OMA presents his assessment of the international situation and suggests solutions to his nations problems. Presumably his orientation would be to keep his nation strong and to maintain or increase force capabilities. Since his interests are primarily focused on his nation's armed forces, his advice may often conflict with suggestions from other advisors. Two prime concerns during the NC meeting would be the size of the Force Capability investment and the distribution of this investment between offensive and defensive capabilities.

(B) Preparation of the Main Decision Form (MDF).-- Since the third and fourth pages of the MDF record changes in nuclear and conventional

weapons, and defense capabilities, the OMA should be responsible for filling out these sections. Thus he remains in close supervision of the nation's armed forces.

(C) Preparation of the Force Utilization Plan (FUP).-- The FUP can be registered with the Simulation Director (SD) as either a defense or attack plan. In this respect the OMA has the following two strategic duties:

(i) Defense - After consultation with the other decision-makers, the OMA can submit one of three designated defense strategies.[10] As international conditions change he is responsible for updating this defense plan.

(ii) Offense - In case of an attack when a response to aggression is required or in the advent of his nation's going to war, the OMA, as the decision-maker chiefly responsible for analyzing the military capabilities of other nations, fills in on the FUP, the most appropriate attack or response (in terms of size, type of weapon used and target) on behalf of his nation. In order to carry out this duty effectively the OMA will presumably develop contingency plans that determine the most efficient and effective kinds of attack to be used against various nations under differing conditions. That is, the OMA would develop a number of standby plans against potential aggressors which determine whether a nuclear or conventional attack is appropriate, the amount of force necessary for each attack and the nature of the target - - - the enemy's armed forces or means of production.

(D) Surveillance of the force capabilities of other nations.-- The OMA makes periodic evaluations of the armed forces of other countries and may make adjustments in his own strategies or advises his HS on appropriate counter-measures if such changes significantly affect his nation's

policies or development.

(E) Attendance at relevant international meetings.-- If the nature of a meeting will affect national security, the OMA may be authorized to attend as an advisor or negotiator. Interpretation of which matters affect security is left to the HS (who assigns his representatives) but obvious cases involve trading force capabilities and agreements that determine a commitment of military strength such as alliance formation, disarmament talks and non-aggression parts.

Finally it should be noted that the above duties should be presented to participants as guidelines for the OMA since the delegation of authority and division of labour are free variables within INS.[11] That is the participants are free to determine the internal organization of their decision-making framework. Thus the OMA may carry out fewer or more duties than suggested here according to the connotation the title "Official Military Advisor" carries for the participants and to the personal styles of the participants. Consequently the degree of influence of the OMA will vary from nation to nation.

The Geographic Dimension

The second innovation of broad consequence is the introduction of geographic dimensions to INS. Harold Guetzkow points out that the omission of the "mechanics of geopolitics" may be a "devastating weakness" and the effort to incorporate such into INS could be "illuminating".[12] I would go further and say the inclusion of this variable is crucial for two reasons - - - the impact that territoriality of nation-states has on the development of national images and the manner in which geographic factors so often contribute toward conflict.

As to the first point, Kenneth Boulding states

> "The schoolroom maps which divide the world into coloured shapes which are identified as nations have a profound effect on the national image."[13]

A map acts as a frame of reference for decision-makers. It provides a means to organize their thoughts about other nations and in some cases to influence their behaviour. For example, as Boulding suggests, there is a tendency for nations to be uneasy with strong irregularities in the shape of countries. The detached nature of East Prussia from the body of Germany before World War II was a strong influence on the discontent of the Nazi leaders.

In INS the question of the development of images of the simulated world is of crucial importance. Participants receive data about the "world" in two ways. Each nation is defined in terms of fourteen political, military and economic variables. Also a history is provided recording events that "occurred" previous to the time the players begin the game. Providing only these two sources of information occasions one of the most frustrating problems encountered in INS - - - infusing into participants a sense of history and involvement with the nations they are representing. By reinforcing the historical account with a map (which at a minimum defines the size, shape and relative positions of states but may be more detailed) the participant is provided with a familiar and natural means through which to assimilate the historical background and to attach the abstract variables to a tangible framework.[14] In short, the simulated world is given substance by spatially defining it. This geographic dimension acts as an important influence in the development of perceptions and images of participants.

This cognition of territoriality (and all its implications) takes on added importance since in the real world geographic factors often impose

restrictions on decision-makers and frequently are a source of conflict. A map in INS provides the researcher with an important vehicle for introducing such realistic constraints and potential cases for disagreement. For example, physical features such as mountain ranges or large bodies of water may be detailed on the map, which could place limitation on the amount of trade, the speed of communication or the movement of forces between nations. Such features could be designed to channel an attack of one nation on another through a third. Thus the research could replicate the problems faced by Belgium or Holland as a natural avenue of advance in wars between France and Germany. Similarly the problems of buffer states could not be studied unless a map was used to show relative positions of nations and restrictions on the channels of attack imposed.

A sufficiently detailed map also affords focal points for potential conflict. For example, if the distribution of raw materials, people and capital within nations were represented, national goals and ambitions could be directed toward the acquisition or protection of such national resources. Border disputes or conflicting claims over the same piece of territory in INS (as presently formulated) have little meaning to participants; they can choose to ignore such problems with no repercussions. However, if such disputed areas contained economic commodities or had bonuses (penalties) of validator satisfaction attached to them, the conflict acquires meaning. The decision-makers stand to make gains or losses in terms of INS variables. If the researcher wished to study situations such as the difficulties that possession of Alsace-Lorraine caused between France and Germany, the ability to replicate such conditions by the use of a map is imperative.[15]

In summary then, there are two compelling reasons to represent the

simulated world by means of a map. It assists the participants in ordering their thoughts about the world and contributes to the sense of seriousness and realism of the simulation. Secondly, the map provides the researcher a practical means of introducing problems and restrictions for the participants which he could not otherwise do effectively. As I introduce other innovations, some will contain further examples of using a map in this manner.

CHAPTER VI

THE COERCIVE FUNCTION

Threat to Achieve Goals

Short of going to war, nations may attempt to achieve their aims by threatening to inflict pain and damage if these aims are not met. In such cases the military provides the potential means of carrying out such a threat. As Schwarzenburger suggests

> "It is the purpose of the armed forces of Sovereign states, by their very existence, to secure agreements in circumstances which, otherwise, parties to diplomatic negotiations would prefer to disagree . . ."[1]

In order that this coercive function be effective the threat must be viable; that is the threatener must possess sufficient force to be capable of inflicting the damage and the threatener must communicate his willingness to use such force if agreement is not reached. Consequently a nation that wishes to use coercion as an instrument of foreign policy must first provide the required force to make a threat viable. This amount of force varies with the goals the nation wishes to achieve but broadly speaking if a nation wishes to gain an advantage or objective of value, its threat is workable when it has a preponderance of force (that is, the capability of winning a military victory) while if the aim were to prevent or deter an opponent from taking action, equality of force (that is, the capability to prevent victory for the enemy) is the minimum requirement. Nations can acquire sufficient force for their aims either by producing them internally, trading for them, pooling forces

in an alliance or improving the quality of existing forces. Or conversely, nations can achieve the required ratio of force to the opponent by taking action to reduce the effectiveness or capability of the opponent. While this action is more difficult than building ones own force, nations can carry out propaganda campaigns to demoralize an opponent's people and leaders, and gather intelligence regarding the exact capabilities and intentions of enemies.

The second component of a viable threat requires that willingness to use force be communicated in a convincing way.[2] If the expression of a threat is not enough to achieve the aims, a nation can escalate the tension level,[3] that is provide more tangible cues to the opponent. Such signals involve mobilization, displays of force, boycotts or blockades, etc.

If a simulated nation were to adopt a policy of coercion it would find the present formulation of INS to be both inadequate and misleading. Inadequacies arise from the omission of rules that admit such action as espionage, mobilization, troop movements, blockades. As a research device INS is misleading in that the production formulae for weapons lead to grossly unrealistic outcomes. The following revisions will correct these defects.

Cost of Production of Nuclear Forces

Present costs of production of Force Capabilities-nuclear (FCn) are determined by the number of such weapons a nation possess. As the number of nuclear weapons increases, the cost per unit decreases.[4] This is done to reflect the initially high cost of developing a nuclear weapons system.

However, toward the end of the cost table the number of BC's per FCn becomes unrealistic. The final cost, 1 BC for 1 FCn, suggests that

eventually nuclear forces will cost the same as conventional forces. This led to such nonisomorphic results as a superpower increasing its nuclear capacity by 1600% over four years during one of the University of Alberta exercises. Such examples tend to be the rule rather than the exception. A number of steps could be taken to prevent such unrealistic results:

(A) Production table revised.-- The number of BC's per unit can be increased. The final production figure should be greater than the costs of production for a conventional unit.[5]

(B) BC production formula revised.-- Much of the increase in weapons can be attributed to unrealistic increases in national production as measured in Basic Capabilities (BC's). In INS, BC increases generally run about 100% over four years which does not reflect the rate of change of GNP for nations in the real world. If the production formula were revised to yield lower increases there would be a commensurate adjustment in FCn production.[6]

(C) Ceiling on defense budgets.-- In peace time defense expenditures of real nations rarely exceed 15% of GNP. Since there is a precedent for setting ceilings on investments in INS (with regard to Capital Investment) a similar maximum allocation can be imposed on Force Capability expenditure. In times of war this ceiling may be raised to represent a wartime economy's increased investment in arms.

(D) Higher Depreciation rates.-- To indicate the rapid obsolescence of weapons systems, especially nuclear, the present INS depreciation rate should be increased.[7]

According to my observations, variances in the size of conventional forces (FCc's) have not been as unrealistic as in FCn's. Adjustments to the BC formula, the ceiling on Force Capability investment and a similar

revision to the FCc depreciation rate would hold these changes to a realistic pace.

Defense Capabilities

In INS there are two types of defense capabilities. The first, BC's Defending Basic Capabilities (BCdef-bc) are meant to protect a nation's Units of Capital (UC's) and population (P). They represent such real world counter parts as radar warning systems, underground shelters or the ability to evacuate, dispersal of industry or population centres and anti-ballistic missiles. BC's Defending Nuclears (BCdef-n) protect the nation's nuclear weapon system. Similarily defensive capabilities represent warning systems, hard defenses such as missile sites, dispersed launch points[8] plus the constant alert procedures followed by superpowers.

There are three major objections to the present defense formulation. First, as with offensive weapon production, the two types of defense can be increased at an unrealistic rate. INS nations can attain invulnerability to nuclear attack, a circumstance unlikely to occur in the real world.[9] Thus the previously mentioned revisions to the BC formula and ceiling on FC investment coupled with increased cost of production or decreased effectiveness of the protection afforded by the two types of defenses[10] could correct this fault.

The second objection lies with the INS rule that a nation's "unprotected industrial, population, and military centres will be hit first."[11] From a reading of the literature on nuclear strategy, such an assumption appears unjustified. Indeed the opposite is the case. Continental defense is emphasized. That is, an attempt is made to destroy all incom-

ing missiles or planes, and all areas are sheltered or evacuated regardless of the targets within the continent at which the nuclear weapons are aimed. Thus the INS rule appears to have no counterpart in the real world. Moreover it provides cumbersome calculations to determine what is or is not protected. INS would not suffer by the omission of this rule.

The final objection concerns the defense of conventional forces. There is an inconsistency that arises between the ability to defend UC's and P, but not FCc's. As stated in the Participant's Manual " . . . FCc's cannot be defended; they provide their own defense".[12] The latter is true of a conventional attack upon conventional forces but not of nuclear attack on FCc's. In some of the University of Alberta exercises the total conventional forces of some nations were destroyed. Such a decisive and complete destruction would not occur in the real world. If, in INS, UC's and P are capable of being protected by BCdef-bc, a similar variable for the defense of FCc's against nuclear attack should be incorporated. This BCdef-c, to use INS terminology, would represent the same types of defenses as replicated by BCdef-bc's.

A minor revision may be added here while discussing INS terminology. The abbreviations used for the different types of defenses is extremely awkward both in writing them in messages and especially in verbal negotiations. It would be much simpler to refer to the variables as "Dp" - - - defense of production (replacing BCdef-bc); "Dn" - - - defense of nuclears (replacing BCdef-n) and "Dc" - - - defense of conventional forces (replacing BCdef-c) thus substituting two syllable terms for seven or eight syllable ones.

Alliances and Validator Satisfaction

The variable Satisfaction on Foreign Affairs (SFA) was initially

used in Northwestern pilot runs as a measurement of satisfaction deriving from national security.[13] Vestiges of this origin remain in the present INS formulation in one of the suggested manners for calculating SFA. The military strength of a nation and its allies is expressed as a ratio to the strength of the numerically strongest alliance (in terms of force capabilities) of which it is not a member.[14] Such a ratio determines SFA. This SFA, in turn, is combined with Domestic Satisfaction (DS) to produce an overall measurement called Validator Satisfaction (VS). This process has serious limitations. Satisfaction of the validators depends on a broad range of factors; if a ratio of forces is used SFA is derived from too narrow a measurement. Furthermore even this measurement can be misleading since some alliances generate a higher degree of security than others and since the national security focus of some nations is not necessarily directed toward the strongest existing alliance. As an example of the first case the alliances between Great Britain and France with Austria, Czeckoslovakia and Poland in the 1930's did not contribute significantly to the security of the latter three, nor in 1938-39 were these agreements appreciated by the leaders and people of the three nations as providing much security.[15] On the other hand some alliances are more believable; it is more certain that alliance members will fulfill their commitments. The problem in INS alliances as with studies on real world alliances is to determine the credibility of such agreements. Some of the suggested methods can be incorporated in INS. For example Richardson has suggested that the cohesion or polarization of alliances correlates with the ratio of intra-alliance trade over general trade of alliance members.[16] The work done on integration by such scholars as Karl Deutsh[17] and Amitai Etzioni[18] may be relevant in that intra-alliance communication

compared to general communication could be used as measurement of cohesion. In short, measurements of the credibility of alliances should in part determine the satisfaction of foreign affairs.[19]

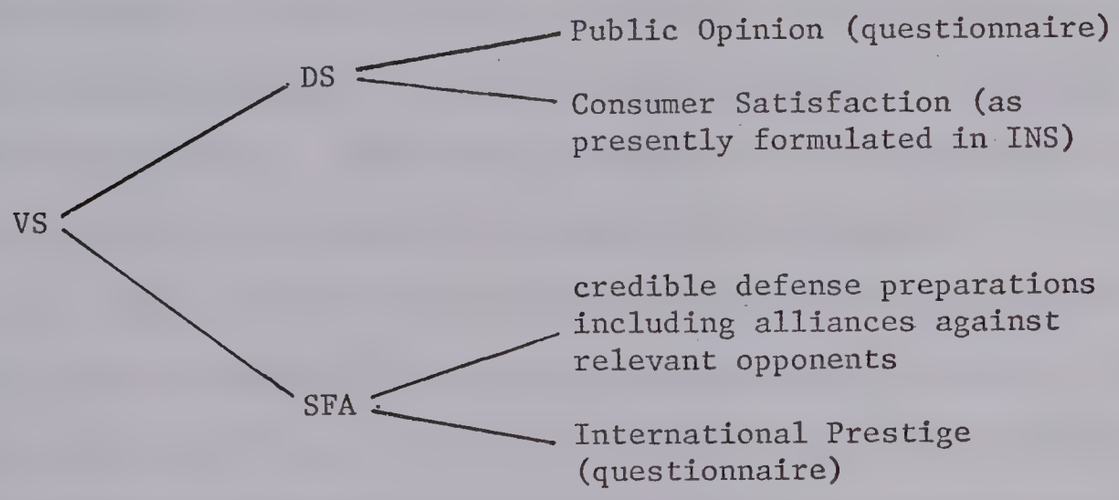
The second inadequacy of using alliance strength ratios as a determinant of SFA is that not all alliances are directed toward counteracting the strongest existing alliance. Nations usually have particular security problems and direct their attention toward opponents of specific concern. That is, within the context of the cold war and the deadlock between NATO and Warsaw Pact powers, numerous other alliances are formed to gain some advantages or deter some action. For example, Arab states band together because they define their security problem as the existence of Israel. SFA of Arab validators would more reasonably depend upon measures taken to counter Israel rather than defend against the strongest alliance (NATO or Warsaw Pact). Carried to extremes a nation like Iceland according to INS procedures, must be the most insecure nation in the world but no reports confirm this. Thus, if a comparison of strength is to be used as a measure of SFA, the Director must temper such calculations with reason, determining which are the reasonable potential aggressors to a state and comparing that state's force preparations in relation to these relevant potential attackers.

But this modification alone does not correct all the fault incurred in the calculation of VS. More factors than alliance membership affect decision-making and the probability of continued office holding by the decision-makers. At least two other important variables, public opinion and international prestige can be fruitfully introduced in INS.

While DS represents the level of contentment with the material goods being distributed to the population, there is an omission of the

factor that can be called "public opinion" - - - the aggregate of opinions and attitudes developed toward a regime. A variable to measure Public Opinion (PO) could be introduced as one determinant of VS.[20] Furthermore in the international sphere nations compete for prestige and favourable opinion from other nations. Thus another reasonable factor determining SFA could be International Prestige (IP). Both measurements could be extracted from participants by means of a simple questionnaire administered regularly during an exercise.[21]

Thus diagrammatically the derivatives of VS (which determines the probability of continued office holding for the HS and the probability of revolution occurring) can be represented as follows:



Propaganda

With the introduction of PO and IP I can turn to some of the ways in which a nation might reduce the effectiveness of an opponent's coercive capabilities. One such means is propaganda or symbolic attack.[22] One effect of propaganda is to cause national leaders to hesitate or undertake some other course of action rather than incur unpopular reaction from other nations or the home population.[23] INS nations can carry out such symbolic attacks on other nations through press releases but if the

target nation chooses to ignore such recriminations there is no penalty or drawback for doing so. If such propaganda is having effect on other nations, the target nation has little opportunity to observe such a reaction. The IP scale, if printed regularly in the world newspaper would provide nations with a means of evaluating the effects of propaganda and to undertake whatever countermeasures necessary. Furthermore, propaganda is often directed at the nationals within a country and is meant to indirectly restrict a decision-maker's freedom of action in the international sphere (not to mention that if discontent can be fomented to an adequate degree the decision-makers of a nation may be required to withdraw forces from the international arena for internal control). Thus allowance should be made for nations to invest BC's into propaganda directed toward other states or to neutralize the effects of propaganda directed toward itself. The relative amounts of BC's invested for such purposes would have the effect of lowering or maintaining PO.[24]

In summary, the introduction of the variables PO and IP provide nations with the option of conducting propaganda which in turn can affect the determination of national decision-makers to carry out certain policies. If these policies involved the use of the military such limitations on decision-makers actions represent realistic and important restrictions that occur in the real world.

Espionage

Another manner in which the effectiveness of an opponent's coercive ability may be reduced is through the gathering of information on his exact force capabilities and intentions. If the size of an opponent's force is known with a higher degree of accuracy countermeasures can be undertaken

more precisely and efficiently and with less cost. Similarly, if an enemy's intentions are known, counteraction can be more immediate and appropriate. Thus nations maintain large agencies such as CIA, M15, and Surrete at large cost to themselves for the purpose of gathering intelligence. In INS, participants have no active means for conducting espionage. Rather every fifth secret message is printed in the world newspaper to replicate information leaks.[25] The only other source of information is provided by a statistical sheet distributed by the Director and updated regularly. (Much of the information, especially concerning force capabilities, is not given exactly but as a range, e.g. 400 - 500 FCn's). There are drawbacks to such a system. First, the espionage function is passive for participants, while in the real world such functions are active; nations invest large amounts of time, money and manpower to gain information. Second, the amount of information is the same for all nations, while in the real world the larger powers, having invested more, would naturally possess a larger amount and more accurate information about other nations. Finally, the manner of publication reduces the value of much of the information. If the intentions of a nation are publicized, this may cause that nation to discard the course of action. The other nations are then in possession of useless data. Information about a nation is most useful if that nation is unaware that other decision-makers possess such knowledge.

In order to correct these faults a number of steps can be taken. The simplest is to distribute opened secret messages directly to nations rather than publishing them. The distribution can be random or frequency of receipt of such messages could be related to the Basic Capabilities (BC's) of nations, the higher the BC's the more secret messages a nation receives. Further, the number of secret messages opened could depend upon the

frequency with which a nation sends such messages. Presumably a nation that uses a high number of secret messages incurs a greater danger of its cypher being broken or codebooks falling into the wrong hands. As a nation increases the number of secret messages sent out, the number of such messages from that nation opened and distributed could correspondingly increase.

These revisions, however, correct only two faults. Espionage is still left as a passive function. To actively involve decision-makers in such a function, investment of BC's towards gathering of intelligence can be introduced. In a manner similar to Research and Development (R&D) allocations, an Intelligence investment (with a maximum of 5%) becomes an option to decision-makers. The degree to which they invest determines the amount of information they receive. According to the purposes of the Director, payoff for espionage investment can result in more refined information (e.g. the range of data is refined from 400 - 500 FCn's to 425 - 450 FCn's) or different types of data are returned for different levels of investment (e.g. low investment returns data on offensive capability only, medium investment adds defensive capabilities, maximum investment also returns some information about national intentions as taken from messages, Statements of Goals and Strategies, and secret Agreement Forms).

A final means for making the espionage function active is to admit the possibility of reconnaissance activities similar to the U-2 over-flights or electronic spy ships. In such a case a nation can direct a number of FCc's towards another country in order to gain particular information.[26] The target nation is informed and if countermeasures are not taken the spying nation would receive more precise information regarding its opponent's armed forces than it normally could achieve through other

channels. Not only does this procedure reflect a regular function occurring in the real world but could provide the source of conflict as occurred with Francis Powers' U-2 flight over the Soviet Union in 1960 or the Pueblo incident in 1968.

In summary, the espionage function can be revised to provide different levels of involvement for different nations and different degrees of knowledge returned to nations.

Movement of Conventional Forces

The final requirement of the coercive function carried out by states is that willingness to use force be conveyed in a convincing manner. The simple expression of a threat is often not enough to convince the perceiver; he may have doubts about the determination of the threatener to actually apply force. Thus, nations have developed certain steps that can be taken to reinforce the verbal threat. That is, they can escalate the threat pattern by providing tangible evidence of their willingness to use force. One time honoured method of communicating a threat is to demonstrate force - - - transfer force to within close proximity of the target area. For example, in 1961 when rumors had circulated that Trujillo's three sons were ready to seize the government of the Dominican Republic, the United States placed 22 warships in patrol off the Dominican shore. Such action was later acknowledged by the Dominican government as having averted an illegal change of office.[27]

In INS the movement of conventional forces as a display of power is precluded by the rules. There are but two ways to transfer FCc's. The Force Utilization Plan (FUP) can be used only if the forces are attacking some target. Also all FCc's committed in this manner are

considered expended.[28] The second manner of transferring FCc's is by normal exchange agreements between two or more nations. The drawback of the latter method is that such transfers are not confirmed until the end of the period when MDF's of the nations are cross-checked.[29] Thus a nation wishing to support another with a transfer of forces must, by the rules of INS, wait until the end of the period before such a transfer is complete. In the real world a similar movement of forces would not take the equivalent number of months to achieve. This issue becomes crucial if, in our example, the nation to receive forces were under attack and had none of its own forces left. It would have 10 minutes to respond to the attacker (i.e. the equivalent of two months real time if periods were 60 minutes long) yet it could not receive aid during that time. It is evident that in the real world conventional forces can be moved quickly and the INS rules would lead to such artificial circumstances as a nation surrendering in war even though it could have received aid.

In order to introduce the option of demonstrating force to INS decision-makers the transfer of FCc's should be exempt from the requirement that transfer of commodities must await the end of the period to be confirmed. On the strength of a properly filled out International Agreement Form (IAF) the Director would sanction a movement of FCc's by confirming these on all relevant MDF's at the time of transfer. The Director may wish to impose a short time lag to represent logistic problems, nevertheless such transfer should be quicker than other exchanges. If FCc's are to be moved to areas other than sovereign states (e.g. an unclaimed territory, or a display of force off a coast line) such transfers should be permissible if submitted to the Director by

FUP and clearly marked for such a purpose. Such FCc's are not attacking but reinforcing a claim or threat. These FCc's would not be expended but are considered an extension of a nation's armed forces. However, they may become the target of attack by some other nation.[30]

Mobilization

Another method of signalling the determination of a nation to carry out a threat is the mobilization of forces. In the nuclear age such an action is less relevant since much of the armed forces of nations are already on constant alert. If, as often predicted, nuclear wars will be of short duration then the amount of force available during the initial stages of war are more crucial than forces that can be mobilized later. However, if modern conventional wars are to be replicated (such as the Arab-Israeli conflicts) or if the pre-nuclear period is to be the focus of the researcher, then the ability to mobilize is an important factor to be included in realistic studies of threats and escalation to war.

In order to simulate mobilization, the FCc's of a nation must be differentiated between those available for immediate use (a certain percentage) and those that can be made available later. Nations would have the choice of determining what percentage of FCc's are effective at all times (to a maximum set by the Director which would represent real world proportions of mobilized to unmobilized forces). To reflect the additional costs of maintaining some forces in constant readiness for combat a higher depreciation rate may be imposed on these mobilized troops.

If a nation wishes to fully mobilize, or change the proportion of ready to unready forces, it can do so by notifying the Director. Total mobilization could be maintained only for a set period at which time the

nation goes to war or demobilizes a percentage of its forces. Such an action would be publicized since these activities would be difficult to keep secret from the decision-makers of other nations. (If the mobilization was meant to reinforce a threat, such publicity would be a desired effect.) After a certain time lag the mobilization would be accomplished. The Director could impose varying mobilization times for nations before the simulation begins to replicate the different rates of efficiency that nations develop. For example, in 1914 the German rate of mobilization was one third that of Russia's.[31] The final consideration is the case in which a nation is attacked before it has fully mobilized its forces. In such a case, the continuation of mobilization depends upon the size of the attacking force. If the attacking FCc's were just large enough to overcome the Defending FCc's, then presumably battle occurred on the borders and enough time was provided by the defense to continue mobilization in the interior. However, if the attacking force was large enough (the size of the excess should be set by the Director before the simulation) then in all probability the aggressor penetrated the nation to the point of nullifying mobilization plans.

To illustrate this last point, two nations may possess the following FCc's:

Nation A	Nation B
200 FCc's immediately available	800 FCc's available
800 FCc's potential	800 FCc's potential

The required excess of force to prevent mobilization is 3/4 of the potential forces. If B attacked A with 300 FCc's, it would gain a victory

over A's 200 available FCc's. However, B's remaining attack force of 100 FCc's does not represent 3/4 of A's potential FCc's. Consequently A continues to mobilize and can respond when her time period is up. However, if B had attacked with a full 800 FCc's, she would have destroyed A's available force and would have had enough excess force (600 FCc's) to penetrate and stop A's mobilization.

In summary, mobilization applied to conventional forces which are differentiated into those available for immediate use and those for potential use. The decision-makers control the size of the two portions and those FCc's in readiness are subject to a higher depreciation rate. The decision-makers can manipulate the size of their ready forces or go to full mobilization for pre-determined lengths of time in order to reinforce threats. Finally it should be pointed out that the only change in forms for such a procedure would be adjustments to the MDF to indicate a nation's mobilization time, and the proportions of ready forces to potential forces.[32]

Blockades

The final method of communicating a threat that will be considered is the capability of nations to blockade other countries. Such a measure is usually taken to prevent a nation from receiving war materials or aimed at disabling part of a nation's economy (this damage can have the immediate effect of halting some intended action or intended action by the blockaded nation or the longer range effect of hampering a build up force). Sanctions or boycotts, that is, the voluntarily refusal to import or export goods to a nation can be imposed in the present formulation of INS. However, there is no procedure by which a nation can be

blockaded. Rules for such a process can be introduced.

Blockades would be imposed on those nations with a sea coast. Land locked nations are usually subjected to sanctions by surrounding nations. If one of the neighbouring nations refuses to enter into sanctions as is the case with Mozambique and South Africa in the Rhodesian issue then the other involved nations must decide whether to apply diplomatic pressure or use force on the nonconforming states. Blockades would be imposed by the allocation of FCc's to represent naval forces. Such a blockade may be partial or total according to the size of the obstacle force. A form used to impose a blockade would be designed.[33] The Blockade Form (BF) would indicate the target nation, the commodity (FCc's, FCn's, BR's, UC's, CS's) that is being restricted and the amount of FCc's committed. Thus to impose an obstacle against one commodity would require a set number of FCc's. To block more commodities would require a larger deployment of force (each item having a set number of FCc's associated with it). Total blockade would require maximum allocation of FCc's. Forces so committed could not be subject to trade, used in war or otherwise put to another purpose during the period that they have been deployed for the blockade. Before the exercise begins the Director may wish to stipulate that such forces would be subject to increased depreciation. To free itself from an effective blockade a nation may either attack the blockading force or negotiate a settlement.

Summary

In this chapter I have suggested that the use of the military for coercion is an important function in the real world. However, the present formulation of INS does not allow nations to conduct such opera-

tions in a realistic manner. The objections to the INS structure have been of two kinds. First, some of the equations produce blatantly non-isomorphic results and changes in the methods of producing force capabilities have been suggested to correct this fault. The second objection is the absence of rules and variables to carry out the many manifestations of coercion that occur in the real world. To make such options available to INS decision-makers I have suggested innovations dealing with propaganda, espionage, movement of forces, mobilization and blockades. These activities do not exhaust the options available to real world decision-makers, but were chosen because they have been significantly used in the twentieth century and are most often associated with major crises.[34] Finally, the absence of these options were most frequently noted by participants during the 18 simulation exercises in which I was involved.

CHAPTER VII

THE APPLICATION OF FORCE

Inadequacies of the INS War Procedure

The second fundamental function of military institutions is to successfully apply force in order to attain national goals; in short, to achieve victory in war. The manner in which force is applied varies with the ends such action is meant to achieve. These ends are as multifareous as the practical reasons often cited for going to war: acquisition of territory, economic gain, increase in status, continued existence of a state or ideology, and retribution, to name a few. The successful application of force through appropriate strategy and tactics has been the subject matter of a good deal of the literature on war.[1] Since war has been one of the prime interactions between states, INS must contain a procedure for conducting battles.[2] However in simulating war the important question arises, to what extent are the many aspects of war to be replicated? To what degree of refinement must different phenomena associated with war be capable of being reproduced? The answer lies in the purpose of the simulation. INS is not intended to be a war game; the purpose of the latter being to uncover and analyze the most effective strategies and tactics that will achieve military victory. Rather INS focuses on relations between states in which one of the important concerns is how and why war is used as an instrument of foreign policy. To satisfy this purpose the process of war must be simulated

in the simplest possible manner which will reproduce realistic general patterns and outcomes. Consequently some of the non-isomorphic characteristics of the war routine are tolerable within the context of the intended focus of INS, and need not be considered defects. The most obvious case is the INS condition that war be fought in ten-minute phases (which represent about two months real time).[3] Although real wars are not fought on such a schedule, these phases are a concession that must be made if time is to be compressed. If a nation is attacked, participants require a minimum amount of time to carry out activities that normally occur in the real world (such as planning a response, negotiating with allies, and bargaining with the aggressor). In order to replicate these realistic patterns, the ten-minute response routine is imposed and, though non-isomorphic, does not seriously violate the realistic developments and outcomes generated by war in the real world.

However, there remain a number of glaring faults that do yield unreasonable results and jeopardize INS as a legitimate research device. These defects have the dual effect of producing international situations that have no realistic counterpart in the real world[4] and of creating a tendency on the part of participants to pursue ends through war because of weaknesses in the rules rather than because of motivations found in the real world.[5] War in INS more often resembles a parlour game rather than an attempt to replicate real-world phenomena. These defects, i.e., those concerning the destructive power of nuclear and conventional weapons, the determination of outcomes of battle, occupation of defeated countries and the omission of the possibility for colonial warfare, can be isolated and innovations introduced to correct them.[6]

Destructive Power of Nuclear Forces

Nuclear forces provide mankind with a weapon, the full potential of which is uncertain. Most educated guesses predict total destruction if unlimited nuclear war were to occur. At least two of the distinguishing features of nuclear weapons over conventional arms are the vastly-increased initial destructive capability and the slower but equally deadly aftereffects of radiation. Concepts of military strategy have undergone radical revisions to compensate for these features; that is, the ability to completely devastate another nation and the possibility that in doing so the victor may be sowing the seeds of his own destruction. The heavy burden of responsibility in controlling such awesome power and the uncertain knowledge as to the aftereffects of nuclear war have in part acted as constraints on real world decision-makers.[7]

In INS only the large-scale initial destructive power of FCn's exists; the aftereffects of radiation are absent. This has the effect of seriously distorting strategies involving the use of nuclear weapons. In my experience, I have found nuclear weapons too often being used by players for strategic "surgical" strikes - - - an alternative not available to real decision-makers. For example, if a simulated superpower wishes to conquer a smaller nation, it usually uses its most efficient means of doing so; nuclear attack is directed at the lesser nation's armed forces. Thus an elimination of that nation's means to resist is achieved, leaving its economy wholly intact. The possession and use of nuclear weapons becomes an easy means to reward rather than the awesome burden for decision-makers it represents in real life. Therefore, to increase the responsibility of maintaining and applying nuclear arsenals, the aftereffects of such weapons must be introduced.

Since the aftereffects of the use of such arms is largely uncertain due to such variables as direction of wind, rain,[8] etc., the exact repercussions of a nuclear attack must remain unknown to INS decision-makers. The Director can develop a scale to be used to calculate radiation effects. Such a scale would be applied if nuclear weapons were used in moderation and would contain a randomizing feature so that economic commodities within the target nation would be reduced to varying degrees. Units of capital and population would be destroyed beyond those reduced by the initial nuclear attack. Since Basic Resources (BR's) in part represent agricultural capabilities, these would also be partially eliminated.

Another important feature that could be contained in the aftereffect scale is possible destruction in nations other than those exchanging nuclear attacks. The possibility is introduced that countries neighbouring target nations might also feel random effects of the nuclear strike or the Director may predetermine that because of the geographic position of certain nations, aftermath effects would of a certainty be encountered. For example, it is a certainty that Canada will not escape the consequences of nuclear war between the U.S.A. and the U.S.S.R. This innovation would have important implications in the development of foreign policies of nations. Leaders of non-nuclear powers would have greater concern about an arms race if they understood that their countries could be affected, even though they were not parties to a war. Under the present INS format, non-nuclear nations can largely ignore arms increases and refinements.

Finally, the Director can predetermine an upper limit to the number of FCn's that can be exploded, after which total planetary destruction takes place. Evidence in regard to this upper limit can be distributed to nations if they allocate some of their FCn's to "testing". As more

FCn's are used for this purpose, more accurate details are returned to the leaders of the testing nations. However, such testing could cause possible radiation effects. Consequently the problems involved in test ban treaties would take on meaning for the participants. Thus the introduction of secondary destructive capabilities for FCn's would provide real world constraints on INS decision-makers and make some of the real world problems in testing and predicting these effects more relevant.

Destructive Power of Conventional Forces

In INS an additive procedure is used to calculate the outcomes of applying conventional force. If two FCc forces fight, the larger always wins.[9] This seriously distorts the strategies involved in using FCc's and clearly does not accurately represent the real world range of outcomes. If a decision-maker discovers the size of an opponent's conventional force with any degree of accuracy, he may be motivated to attack with a force of n + 1 FCc's simply because victory is assured. For example, in a battle between a force of 3,000 FCc's and 3,001, the latter automatically wins. With victory a foregone conclusion, many simulation wars are not undertaken for the same motives and with the same reluctance as occurs in the real world. In short, an element of uncertainty about the outcome must be introduced into INS wars.

A second major defect of the war procedure is the rule that requires all forces committed to war to be destroyed. Such may be the cases with FCn's since both the warhead and delivery vehicle are destroyed on impact. But with FCc's, which represent men and machines besides ammunition and bombs, the total is not used up in attack. Interpreting INS rules literally can lead to such unlikely results as a force of 10,000 FCc's attacking

one FCc, with both commitments destroyed in battle. Consequently, INS war procedure must be revised to the extent that a certain portion of FCc's allocated to war may remain available for further use. These two defects can be corrected.

One way to introduce an uncertainty in the outcomes of battle is to design qualitative besides quantitative difference between forces of different nations. In the real world such differences in efficiency of equipment, training of troops, morale, efficiency of communication systems, or chains of command and competency of top military leaders do exist. Consequently, a national force that appears numerically inferior to another could in fact be qualitatively superior, as was the case of the German army compared with the Russian forces in 1914-18. Such differences can be easily accomplished by attaching a "destruction factor" to the FCc's of each nation - - - that is, a factor by which the Director multiplies the normal destructive capability of FCc's. In the example cited, the German factor could be 1.5, while the Russian factor would be .75. Thus, while two apparently equal forces meet, the German force would actually have twice the capability of the Russian.[10] Nations would only know their own destructive factor, although information about the capabilities of others could be pursued through espionage. The general qualities of FCc's of different nations should also be intimated in the history given to participants before the simulation to provide some realistic guidelines to their policy planning.

An alternate means of introducing uncertainty is to design a stochastic process for determining the outcomes of battle. The prerequisites of this innovation are that both parties to a battle designate the size of force they are committing and targets that are attacked must be defined. Thus a

nation-at-large is not attacked, rather regions or provinces (as designated on the map) become the battleground. The aggressor commits a certain number of FCc's and the defender is given a similar opportunity (with a brief time limit). The outcome of battle is determined by the Director through the use of a random number table. The key principle involved is that equivalent forces have an equal chance of winning; a larger force stands a better chance of victory, but within pre-established parameters a smaller force can possibly win. Once results are reported to the combatants, the initiative lies with the victor to continue his attack or reinforce his captured position. If the latter occurs, the loser is given the opportunity to counter-attack.

This innovation contains a number of features that make conventional war in INS more realistic. The tendency under the present INS format is to have an immediate showdown of all forces. In the real world such a showdown would be unlikely, even if it were physically possible (which in most cases it is not). Thus conventional warfare is substantially differentiated from nuclear warfare. Also a minor, but irritating, defect in the present INS war procedure can be corrected. It is generally accepted that the defensive position holds up to three times the advantage over the offense.[11] Wouldbe aggressors usually plan on using a preponderance of force. Such a defensive advantage could be introduced into the table that determines outcomes of battle, thus compelling aggressors to account for this factor.[12] Conventional wars would develop along realistic patterns with certain territories won or lost. Thus the war potential of nations could be increased or decreased according to the resources gained or lost.

Finally, the second-mentioned defect could be corrected. The de-

signed table which determines battle outcomes could also determine the remaining portions of forces. These forces become significant because they can be reused for further attack or to defend a captured area.

The proposed innovation is more sophisticated than the present INS war procedure and it may be argued more complicated for participants. But upon closer inspection, this is not the case. The outstanding feature of this revision is that the destructive formulae can be eliminated.[13] The war planners of simulated nations no longer would play a "numbers game", computing the various permutations and combinations involved in comparing the armed forces of nations, as now occurs in INS. The attention of such strategists would more accurately focus on the use of force to attain tangible ends - - - such as the capture of territory and resources and the systematic (as opposed to a showdown) destruction of an opponent's armed force.

Occupation

The revised procedure automatically cures another defect of INS, that occupation of a nation can occur without an occupying force. Even if the proposal is not adopted, some revision is required to correct this fault. Presently in INS, a victorious nation may occupy a defeated country. Such an option incurs a double depreciation of FCc's.[14] This process is unrealistic since it does not reflect the different degrees of difficulty involved in occupying nations. Taken to extremes, the rule suggests a nation like Luxembourg is as difficult to hold as would be the United States. Furthermore, such a rule precludes liberating wars. Since no FCc's exist in an occupied nation, there is no target to attack (unless the means of production are attacked which really is not the point of a

liberating effort). Consequently, if a nation wishes to occupy another, it should be required to commit a certain amount of FCc's to this end. The number required can be related to some indicator of the degree of difficulty in holding a nation. Thus the occupying force may be related to the nation's population or level of Basic Capabilities. Liberating powers would then have the option to attack the occupying force.

A phenomenon associated with occupation is annexation. If a victorious nation wished to transfer a portion of territory from the defeated country to its own, it should be able to do so provided that it is willing to incur the costs of "pacifying" the area. Thus a pre-determined commitment of FCc's would accomplish the annexation of certain regions (as designated by the map) and the transfer of the resources contained in the region to the victorious nation. Such an action could provide a continuing source of conflict between nations (such as the Alsace-Lorraine issue) or could provide a focal point for propaganda and civil disturbances (such as the Sudentanland).

Colonial War

Quincy Wright describes three types of war: international, colonial and civil.[15] Civil war will be dealt with in the following chapter. International wars do occur in INS, but there is no provision for colonial war. Historically nations have expended forces to secure territory and resources that are not under the jurisdiction of a sovereign government as we understand in the modern nation-state. Moreover these attempts to create empires have been an important source of conflict between nations.

This defect can be corrected if the researcher or Director desires to do so by defining certain unclaimed territories on a map. Each region

would possess a certain number of economic resources (BR's, UC's, P, and CS's). Nations may lay claim to such areas by directing a number of FCc's to these regions. Each such territory would have a "control factor" indicating the number of FCc's required to overcome indigenous resistance. If the claim is not challenged (and the control requirement fulfilled) the colonizing nation may then begin transferring the economic resources of the occupied area to its home economy according to a schedule determined by the Director. Such a transfer is not operative if two (or more) nations dispute the claim over an area by both sending FCc's. The two forces may engage each other if one of the nations involved transmit this intention to the Director. Such resulting wars may be resolved if one nation achieves a victory or the other's forces, if one nation voluntarily withdraws or if an agreement is reached specifying the control responsibilities and the distribution of the economic returns. Nations engaged in such a war may continue to reinforce their claims by sending more FCc's to the disputed area. Transfer of commodities does not occur until one nation clearly has gained possession (i.e. maintained occupation for a designated length of time).

Summary

The major thrust of the revisions to the application of force function has been to develop an uncertainty about the outcome of war and to differentiate the strategic use and effects of conventional war from nuclear attack. More sophisticated war procedures have been introduced, but the added complexity has been compensated for by the omission of the destruction formulae. War, in INS, can now be carried out more realistically with participants concentrating on strategic questions that occur

in the real world rather than manipulating numbers to determine whether war is feasible or profitable as is the case with the present INS war procedure.

CHAPTER VIII

INTERNAL CONTROL

The Inadequacy of the Revolution Procedure in INS

There are various domestic roles performed by the armed forces ranging from the delivery of mail during a strike to the suppression of an illegal attempt to seize a government. Most of these functions are of minor consequence to the international system except the major duty to protect the official decision-makers during times of revolution. Even purely indigenous civil disturbances provide inputs into the international system such as the possible appearance of a new national leader, the loss of national capabilities due to a destructive civil war, and the withdrawal of some conventional forces from the international arena. The present INS revolution procedure does produce such inputs. That is, following the INS principle that all domestic processes are programmed[1] the possibility of a revolution occurring and the probability of its succeeding are computed by the Director between periods according to predetermined formulae.[2] The participants are not actively involved in domestic functions; rather they allocate certain national resources to internal processes and await the outcomes of the Director's calculations. As stated, this revolution procedure is realistic to the extent that it generates results that have some influence on the interaction between states. However, it fails to reflect a major phenomenon of international relations - - - one that has gained critical importance in the contem-

porary international system - - - which is foreign intervention in internal wars. The present INS revolution procedure is founded on the implicit assumption that all civil wars are purely indigenous, while in fact, as K. J. Holsti points out:

> "In some 200 revolutions which occurred during the first half of the (twentieth) century, foreign intervention took place in almost one half; in approximately 50 of these revolutions, more than one outside power intervened. . . . Most international crises of the period have started basically as internal revolution or civil disturbances, in which one or more external states eventually became involved."[3]

The present INS format gives no opportunity for external actors to interfere in the domestic affairs of others, hence eliminating a significant source of international conflict. Therefore, to broaden the range of international interaction that can be explored through INS, the revolution procedure must be radically changed to make available to players the crucial option of becoming involved in domestic disorders of other nations. In other words, the revolution format must be changed to become an active process, permitting player participation, from the passive procedure as it now exists. In order to revise the INS revolution program it is first necessary to discuss how disorderly changes of government occur in the real world. A comprehensive discussion of this subject is beyond the scope of this work and in reality unnecessary as it has been treated in detail elsewhere.[4] However, it will be helpful to identify the fundamental elements of disorderly change. Doing so is most fruitfully pursued by determining who the major contenders for power are during a period of disorderly change and what means they characteristically use in attempting to seize control of the government.

Military Intervention in Domestic Politics

A phenomenon of growing significance in the past few decades is that military establishments often default on their duty to protect their government. Increasingly the military itself is the source of illegal attempts at seizure of power.[5] In recent history military takeovers have been all too characteristic of developing nations, although such attempts can occur in industrialized nations (such as Germany in 1920) if a high enough degree of discontent exists.[6] The chief method used for these attempts is the coup d'etat - - - a quick strike involving a small group of conspirators aimed primarily at replacing the leaders of the regime in power. Usually there is no intention to change the form of government, only the personnel (although a number of military juntas do "temporarily" suspend the constitution). Another method through which the military becomes involved in domestic politics is through passive support of civilian uprisings. This is accomplished through the negative strategy of not rigorously applying force to suppress civil disorder. For example, German armed forces, when called out to control demonstrations and street fighting, were less strenuous in their control of Nazi Brown Shirts that Communist agitators.[7]

The architects of INS were aware of the possible disloyalty of the military and tried to compensate for it. As Guetzkow states:

> "Because of the tendency of the armed services to participate in revolutions in many parts of the real world, the effectiveness of the forces loyal to the office-holders is expressed as a percentage of the total forces in existence (FCic/FC)." [8]

However, since the HS determines the percentage of FCc's allocated to internal control, he is in effect assigning the "loyalty" of his own military forces. Moreover, if the HS allocates the maximum FCc's (30%)

he insures the failure of a revolution.[9] These capabilities of the HS in simulation have no counterpart in the real world. Thus the revolution procedure of INS must be revised so that the loyalty of the military is determined independently of the HS's desires and that there is always a chance that a revolution may suceed no matter how many forces are committed to internal control. Such changes are incorporated in the new revolution mechanics to follow. In order to put such a discussion in a proper context we will first discuss certain aspects of civil disorder that trigger military involvement.

Insurgency and Guerilla Warfare

The civil source of disorderly change by definition derives from the civilian population. Motives for such uprisings can be as numerous as the various interest groups in a particular society. Civilians usually do not possess organized military institutions; they chiefly rely on a form of fighting called guerilla warfare to bring about the downfall of a government. Increasing attention has been focused on this approach by communist leaders, such as Mao Tse-tung, Che Gueverra, and Vo Nguyen Giap.[10] The appeal of guerilla warfare lies in its unconventionality. At present guerilla fighting seems to offer the most effective way of counteracting large traditional armed forces since it radically departs from the conventional methods of combat.

One such important difference between traditional and guerilla warfare is that the latter is almost totally cumulative.[11] That is, numerous small independent battles are fought and accumulated victories add up to final success. The military objective in guerilla warfare is to cause the slow attrition of government forces. If a large scale commitment of forces is undertaken, it usually occurs at the end of a campaign (such as the battle at Dien Bien Phu).

Another important difference between conventional and guerilla warfare is in the nature of the difference between the soldier and the guerilla. The soldier is by comparison a professional warrior trained to seek military victory on the battlefield against similar professionals using traditionally proven tactics (such as concentrating forces or outflanking a front). On the other hand, the guerilla is an agitator who seeks to alienate the civilian population from the regime in power, who depends on harrassment and sabotage to demoralize the enemy and who is self-sufficient (or at least depends on captured items for supply). In short, the soldier and the guerilla are "playing" two different games which involve different rules and standards of success.

These differences have an important bearing on INS. Even though guerilla warfare finds extensive use in the real world[12] there is no option available to INS decision-makers allowing them to employ this unconventional mode of fighting. Conditions like those which have occurred in Southeast Asia where both French and American conventional forces have failed to gain a military victory over seemingly weaker opponents could not be replicated. Thus any revision to the INS revolution processes should incorporate the possibility of a civilian attempt to overthrow a government through the use of guerilla-style attack.

The Revised Revolutionary Process

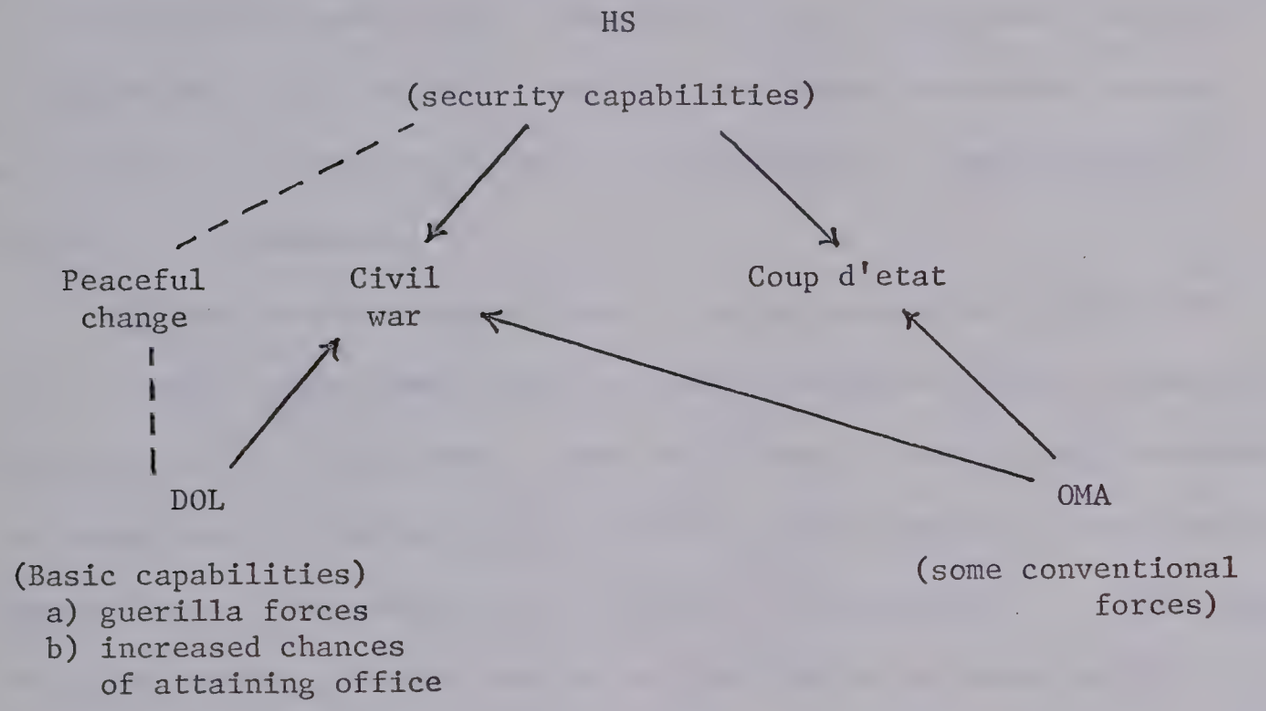
Having identified the two main contenders for power, the military and civilian isurgents, as well as their chief methods of attaining control of the government, the coup d'etat and guerilla warfare, I can proposed revised mechanics for disorderly change of office that incorporates the ideas presented about.

First the role of the Head of State will be considered. The Head of State is not fully dependent on the military for protection against illegal attempts at seizing his office. He possesses a certain amount of capabilities to counter such attempts no matter what their source. His concrete capabilities are represented by the ability to utilize the civil police force for his protection or to develop a private army or body guard that is essentially independent of the military establishment.[13] There are also intangible capabilities. For example, in most cases the weight of legitimacy rests with the Head of State; conspirators must convince the general populace that their move is proper. This may be quite difficult as the incumbent government possesses organizational control over the major means of appeal to the people. Citizens have developed a socialized loyalty to government institutions and the officially adopted patterns for changing regimes. Hence the Head of State can depend upon a certain amount of inertia among the people, as well as a certain amount of support from the government officials out of habit, which will obstruct any attempts at illegal capture of the policy-making apparatus. Thus the HS in INS can legitimately be represented as possessing independent capabilities to counteract revolution or coups.

The revised internal war process would involve three decision-makers. The HS would possess Security Capabilities (SC's) which represent those forces he could mobilize and loyalty he could invoke to suppress an attempt to seize his office. The OMA would command a certain percentage of the nation's armed services that he could use against the government if he chose to do so. Finally the Domestic Opposition Leader (DOL) would have the option to seize government illegally. Since he represents civilian opposition to the regime in power, he could develop force capabilities

which would use guerilla tactics. A new variable called Guerilla Force Capabilities (FCg's) is introduced to represent the latter. The DOL, of course, can forego rebellion and continue to strive for office through regular channels. In this case, his resources would be devoted to increasing his chances of attaining office through officially-sanctioned means.

The decision-makers involved, their capabilities and their options can be represented diagramatically as follows:



The capabilities of the contenders become operative as satisfaction with the HS declines (i.e. as VS drops). The assumption here is that any group attempting to seize office by irregular means must rely on a significant degree of discontent among the mass, or the people upon whom the government depends for support, in order to obtain the resources and momentum for carrying out their attempt. A similar measurement appears in the present INS formulation. Presently, risk of revolution only occurs when VS drops to three or less.[14] However, in INS, the possibility

of disorderly change is also directly related to Decision Latitude.[15] The underlying assumption is that in totalitarian states potential usurpers will more readily use extraordinary means for achieving office than in democratic states. Such an assertion is unreasonable since it does not account for the numerous real world cases in which attempts have been made against non-totalitarian governments.[16] The many putsches attempted against the German government in the 1920's are an example of a nation with essentially a democratic form of government but with a high degree of discontent. Thus VS alone should determine whether a revolutionary condition exists, leaving aside any considerations of the form of government.

Military leaders, being closer to gevernment power centres and with a readily mobilizable force on hand, contemplate illegal takeovers before civilian counterparts. Thus as VS drops below the coup threshold (as determined by the researcher) the OMA gains command of a set percentage of FCc's. This percentage increases as VS drops lower. Since coups are quick strikes, in the event of an OMA wishing to seize control, he would inform the Director and all his FCc's are directed at the HS. The HS is informed of the coup and can counter with SC's. A showdown occurs immediately; the outcome is determined probabilistically with the larger committed force having the greater chance of winning.

As VS drops lower the DOL receives a percentage of the BC's of the nation. Presumably the civilian leaders could divert part of the energy and materials of a nation for their own use. As VS decreases, the percentage of BC's received by the DOL increases. He may use these to produce FCg's (according to a formula predetermined by the Director) or

apply these BC's to lowering the probability of the HS retaining office. If the BC's are utilized in the latter manner the Director would take these into account when making his between-period calculations.[17] If the DOL chooses to gain office through force he may activate his accumulated FCg's (or a specified part of these) against the HS. Outcomes of battle would be determined probabilistically but the effects of FCg's against conventional forces would be weighted to reflect the fundamental advantages that guerilla warfare holds over the latter. A defeat for the DOL has no consequences; he may continue attacking as long as he has forces to do so, thus replicating a war of attrition. Furthermore as his attacks persist, the Public Opinion scale (if adopted) can be lowered to represent successful agitation and a corresponding alienation of the mass from the regime.

These changes necessitate the design of a new form which can be called the Force Activation Sheet (FAS). This FAS would contain provisions for recording the different capabilities possessed by each decision-maker and can be submitted to the Director to activate internal war. If the military forces are to be used to suppress a civilian (FCg) attack, both the HS and OMA must sign. This represents the ability of the military establishments to tacitly support rebellions by withholding or diverting force capabilities as mentioned earlier.

With the description of these major elements of the revised disorderly change process, the implications of the new mechanics can be discussed. Loyalty of the armed forces no longer depends upon the HS's assignment of FCc's to internal control. Rather this loyalty becomes the decision of the OMA, who assesses the situation he faces and determines whether the military should act, much as occurs in the real world.

Similarly the decision to use civilian force to change office is based on the assessment of the DOL. From this follows the major implication for INS. The forces available to the DOL can be supplemented by external powers. Other nations can become involved in the domestic disturbances of a nation by encouraging the DOL to take action and by assisting him to maintain his attacks on the government. Clearly such interventions could escalate into international crises as they do in the real world.

Summary

The civil war function of INS can be made active. That is, the function does not depend on the results of equations calculated by the Director, but on the decisions made by participants. Furthermore, this revised process admits foreign intervention. Finally, it should be noted that although the new mechanics for disorderly change are more comprehensive than the old process, this added complexity can be compensated by the judicious assignment of the characteristics of the simulated nations. The researcher must be careful to design his world so that only a few nations have domestic problems that could lead to revolution, and that other countries are stable enough so that they would only be concerned about the alternatives involved in intervening. In this manner, the focus of INS properly remains on international interaction.

SUMMARY

I have focused on the military subsystem of one particular simulation model, INS, in order to identify the major defects and to suggest innovations which would correct these faults. In doing so a subjective technique was applied since a face validity test is most appropriate in the early stages of the development of a simulation model.

Two major innovations concerned the creation of a new decision making role (the OMA) to represent national military establishments, and the introduction of geographic factors into INS.

By isolating three important functions carried out by the armed services of real nations I was able to focus on a number of INS weaknesses. Under the coercive function it was discovered that a number of INS formulae produced nonisomorphic results. Consequently suggestions were made for the revision of the FCn and FCc production procedures. Furthermore many of the military alternatives available to real world decision-makers were precluded by an absence of explicit procedure to INS participants. Therefore I suggested the manner in which movement of conventional forces, mobilization, propaganda, espionage and blockades could be introduced into INS.

The war procedures of INS were also found to be unrealistic, often leading to highly unrealistic results. The two major defects involved the certainty of predicting the outcome of war and the lack of differentiation between nuclear and conventional forces. I introduced a fallout effect for nuclear weapons and proposed an elaborate procedure for using

FCc's. This procedure admitted the more realistic use of conventional weapons such as the invasion of territory to acquire economic advantages. An innovation allowing for colonial warfare was also proposed.

The third major function, internal control, was found to have important international implications and required extensive revision of INS revolution procedure. The disorderly change of office function was made active, that is, involving the HS and two possible contenders for power. Each decision-maker involved possessed capabilities to seize or protect the office of HS; the DOL's forces could be supplemented by an external power. This, it was argued, would lead to important sources of international conflict that were impossible in the present INS formulation.

As mentioned at the opening of this work, the next step is to actually operationalize some of the innovations and test them in simulation exercises. After the military subsystem has been adjusted, the economic and political will undergo similar close attention. I hope to pursue these tasks in the near future.

FOOTNOTES

Introduction

1. Harold Guetzkow and Cleo H. Cherryholmes, Inter-Nation Simulation Kit: Instructor's Manual and Participant's Manual, (Chicago: Science Research Associates, Inc., 1966).

2. See for example Richard W. Chadwick, "An Inductive Empirical Analysis of Intra- and International Behaviour Aimed at a Partial Extension of Inter-Nation Simulation Theory", Journal of Peace Research, #3, (1969).

3. Instructor's Manual, p. 3.

4. See pp. 25-27.

5. "Isomorphism" is commonly used to mean a one-to-one correspondence between elements of a model and elements of the referent phenomenon. In this work "isomorphic" will be used as a synonym for "realistic". For further elaboration on the meaning of the term see May Brodbeck, "Models, Meaning and Theories" in May Brodbeck (editor), Readings in the Philosophy of the Social Sciences, (New York: The MacMillan Company, 1968), p. 580.

Chapter I

1. Richard E. Dawson, "Simulation in the Social Sciences" in Harold Guetzkow (ed.), Simulation in Social Science: Readings (Englewood Cliffs: Prentice-Hall, Inc., 1962), p. 3.

2. Sidney Verba, "Simulation, Reality and Theory in International Relations", World Politics, Vol. XVL, #3, (1966), pp. 502-03.

3. Harold Guetzkow, "A Use of Simulation in the Study of Inter-Nation Relations", Behavioral Science, Vol. IV (July, 1959), p. 183.

4. Charles F. Hermann, "Validation problems in Games and Simulation with Special Reference to Models of International Politics", Behavioral Science, Vol. XII, #3, (1967), p. 217.

5. Guy Orcutt, Martin Greenberger, John Korbel and Alice Rivlin, Microanalysis of Socioeconomic Systems: A Simulation Study, (New York: Harper & Bros., 1961), p. 10.

6. Harold Guetzkow, "Inter-Nation Simulation: An Example of a Self-Organizing System", in Marshall Yovits, George Jacobi and Gordon Goldstein (ed.), Self-Organizing Systems, (Washington: Spartan Books, 1962)

7. See, for example, Martin Shubik, "Simulation of Socio-Economic Systems", General Systems, Vol. XII, (1967), p. 151; Anatol Rapoport, "Games Which Simulate Deterence and Disarmament", Peace Research Reviews, Vol. I, #4, (1967), pp. 66-68.

8. Dawson, loc. cit., p. 8.

9. Anatol Rapoport, Strategy and Conscience, (New York: Harper and Row, 1964), p. 129.

10. Rapoport, loc. cit., p. 69.

11. John R. Raser, Simulation and Society: An Exploration of Scientific Gaming, (Boston: Allyn and Bacon, Inc., 1969), p. 96.

12. W. E. Alberts, "report to the Eigth AIIE National Convention on Systems Simulation Symposium", in D. G. Malcolm (ed.), Report of Systems Simulation Symposium, (Baltimore: Waverly Press Inc., 1958) p. 4.

13. Duncan Luce and Howard Raiffa, Games and Decisions, (New York: John Wilry and Sons, Inc., 1957) p. 4.

14. T. C. Schelling, "Experimental Games and Bargaining Theory", World Politics, Vol. XIV, #1, (October, 1961), p. 49.

15. Karl W. Deutsch, The Analysis of International Relations, (Englewood Cliffs: Prentice-Hall, Inc., 1968), p. 124.

16. David Swartz, "Problems in Political Gaming", Orbis, Vol. IX, #3, (Fall, 1965), p. 678.

17. Sidney Giffin, The Crisis Game: Simulating International Conflict, (New York: Doubleday and Compancy Inc., 1965), Chpts. I & II. Giffin provides a history of war games and suggests that such games can be traced to the invention of chess.

18. Guetzkow, "Use of Simulation", p. 184.

19. Herbert Goldheimer and Hans Speier, "Some Observations on Political Gaming", World Politics, Vol. XII, #1, (October, 1959), pp. 71-72.

20. Michael H. Banks, A.J.R. Groom and A.N. Oppenheim, "Gaming and Simulation in International Relations", Political Studies, Vol. XVI, #1 (February, 1968), pp. 2-3. See also Lincoln Bloomfield and Barton Whaley, "The Political-Military Exercises: A Progress Report", Orbis, Vol. VIII. #4 (Winter, 1965); Richard Barringer and Barton Whaley, "The M.I.T. Political-Military Gaming Experience", Orbis, Vol. IX, #2 (summer, 1965). Major wargaming efforts in the U.S.A. continue. Isreal Skerher, "When Generals Play, It May be War", (The New York Times, July 1, 1969, late edition, p. 43 and 65) reports that $300,000 war game facilities have been constructed at Fort Leavenworth and that an estimated 30,000 American officers and scientists are engaged in wargaming activities.

21. Guetzkow, " A Use of Simulation", p. 184.

22. Oliver Benson, "A Simple Diplomatic Game", in James N. Rosenau (ed.), International Politics and Foreign Policy, (New York: The Free Press, 1961), p. 511fn.

23. Guetzkow, "A Use of Simulation", p. 185; Banks, et. al., loc. cit., p. 3.

24. Raser, op. cit., chpt. III ("Intellectual and Historical Roots of Social Science Simulations") provides a brief description of the contribution of these approaches and fields of study.

Chapter II

1. David V. Edwards, International Political Analysis, (New York: Holt, Rinehart and Winston, Inc., 1969), chapter II is representative of this concern.

2. Richard A. Brody, "Varieties of Simulation in International Relations Research", in Harold Guetzkow, Chadwick F. Alger, Richard A. Brody, Robert C. Noel and Richard C. Snyder, Simulation in International Relations: Developments for Research and Teaching, (Englewood Cliffs: Prentice-Hall, Inc., 1963) p. 195. (hereafter cited as Developments)

3. Verba, loc. cit., p. 500.

4. David Singer and Hirohide Hinomoto, "Inspecting for Weapons Production: A Modest Computer Simulation", Journal of Peace Research, Vol. II (1965), p. 19; Ithiel de Sola Pool and Robert Abelson "The Simulmatics Project" in Guetzkow, Readings, p. 72. Both works suggest inadequacy of real world data as a rational for using simulation.

5. George Morgenthaler, "The Theory and Application of Simulation in Operations Research", in Russel Ackoff (ed.), Progress in Operations Research, Vol. I (New York: John Wiley and Sons, Inc., 1961), pp. 366-67.

6. Richard Snyder, "Some Prospectives on the Use of Experimental Techniques in the Study of International Relations", in Developments, p. 3.

7. Shubik, loc. cit., p. 156.

8. Benson, loc. cit., pp. 509-10.

9. Morgenthaler, loc. cit., p. 373.

10. Russel Ackoff, Shiv Gupta and Soyer Minas, Scientific Method: Optimizing Applied Research Decisions, (New York: John Wiley and Sons, Inc., 1962), p. 426.

11. Morgenthaler, loc. cit., pp. 373-74.

12. Ibid. p. 374 .

13. Snyder, loc. cit., p. 9.

14. Ibid., pp. 7-8.

15. Morgenthaler, loc. cit., p. 375.

Chapter III

1. Robert T. Golembiewski, William A. Welsh, William J. Crotty, A Methodological Primer For Political Scientists, (Chicago: Rand McNally and Company, 1969), p. 281 (emphasis in original).

2. Sarane S. Boocock and James S. Coleman, "Games with Simulated Environments in Learning", Sociology Of Education, Vol. 39, #3 (Summer, 1966), pp. 216-18.

3. Hall T. Sprague, "Using Simulations to Teach International Relations", Western Behavioral Sciences Institute, (mimeo), n.d., pp. 14-15. As Sprague points out these ideas are untested as yet and can only be reported as claims until further evidence is obtained.

4. Chadwick F. Alger, "Use of the Inter-Nation Simulation in Undergraduate Teaching", in Developments, p. 179.

5. Raser, op. cit., p. 118.

6. See John C. Ausland and Colonel Hugh F. Richardson, "Crisis Management: Berlin, Cyprus, Laos", Foreign Affairs, Vol. 44, #2 (January, 1966).

7. Harold Guetzkow, "Simulation in International Relations", in William Coplin (ed.), Simulation in the Study of Politics, (Chicago: Markham Publishing Co., 1968), pp. 9-10.

8. Brody, loc. cit. in Developments , p. 196.

9. Bloomfield and Whaley, loc. cit., pp. 854-57.

10. Morgenthaler, loc. cit., p. 374

11. Raser, op cit., p. 86.

12. Hermann, loc. cit., p. 219.

13. Richard A. Brody, "Some Systemic Effects of the Spread of Nuclear Weapons Technology: A Study Through Simulation of a Multi-Nuclear Future", Journal of Conflict Resolution, Vol VII, #4, (1963).

Chapter IV

1. For example, see Golembiewski et. al., op. cit., Chpt. IX; Bernard C. Cohen, "Political Gaming in the Classroom", The Journal of Politics, Vol. 24, #2 (May, 1962); Thomas E. Drabek and J. Eugene Haas, "Realism in Laboratory Simulation: Myth or Method?", Social Forces, Vol. 45, #3 (March, 1967).

2. Golembiewski, et. al., op. cit., p. 307.

3. Verba, loc. cit., p. 498.

4. Harold Guetzkow, " Structured Programs and Their Relation to Free Activity Within Inter-Nation Simulation", in Developments , p. 147.

5. See for example, Harold Guetzkow, "Some Correspondence Between Simulations and Realities in International Relations" in Morton A. Kaplan (ed.), New Approaches to International Relations, (New York: St. Martin's Press, 1968); Richard W. Chadwick, "An Empirical Test of Five Assumptions in an Inter-Nation Simulation, About National Political Systems", General Systems, Vol. XII (1967); Terry Nardin and Neal E. Cutler, "Reliability and Validity of Some Patterns of International Interaction in an Inter-Nation Simulation", Journal of Peace Research, #1, (1969); Charles F. Hermann and Margaret G. Hermann, "An Attempt to Simulate the Outbreak of World War I", American Political Science Review, Vol. 61, #2, (June, 1967); and Dina A. Zinnes, "A Comparison of Hostile Behaviour of Decision-Makers in Simulate and Historical Data", World Politics, Vol. XVIII, #3 (April, 1966).

6. Hermann, loc. cit., pp. 221-22.

Chapter V

1. Kurt Lang, "Military", International Encyclopedia of the Social Sciences, Vol. 10, 1968, p. 305.

2. B. H. Liddell Hart, Strategy, (revised edition, New York: Frederck A Praeger, 1964) p. 351.

3. This is not to say that the application of force is obsolete. However, most recent literature focuses on the limited application of force as opposed to all out nuclear war. See, for example, Morton H. Halperin, Limited War in the Nuclear Age, (New York: John Wiley & Sons, Inc., 1963).

4. Thomas C. Schelling, Arms and Influence, (New Haven: Yale University Press, 1966), Chpt. I.

5. Nagendra Singh, The Defense Mechanism of the Modern State, (Bombay: Asia Publishing House, 1964), p. 393.

6. For example in new nations the military often serves as an important modernizing agent. See William Gutteridge, Military Institutions and Power in the New States, (London: Pall Mall Press, 1964), Chapt. V.

7. Barbara Tuchman, The Guns of August (New York: Dell Publishing Co., 1962), Chpt. 2.

8. See, for example, Samuel P. Huntington (ed.), Changing Patterns of Military Politics, (New York: The Free Press of Glencoe, Inc., 1962); Morris Janowitz and Lt. Col. Roger Little, Sociology and the Military Establishment, (New York: Russell Sage Foundations, 1965), esp. Chapt. 6; Gene M. Lyons, "The New Civil-Military Relations", in Davis B. Bobrow (ed.), Components of Defense Policy, (Chicago: Rand McNally & Company, 1965); John Kenneth Galbraith, How to Control The Military, (New York: Doubleday and Company, Inc., 1969) and, Vincent Davis, The Admirals Lobby, (Chapel Hill: The University of North Carolina Press, 1967), esp. Part III.

9. In Ins, one person is responsible for the duties of many real world organizations and structures. For example the Official Domestic Advisor encompasses such officials as the secretaries of labour, commerce, agriculture, interior, etc., see Participant's Manual, p. 6. Also the number of decision-makers per nation is set by the researcher/teacher according to his purpose. Guetzkow suggests the number can vary from two to six, Developments, p. 106.

10. Participant's Manual, p. 19.

11. Developments, pp. 107-08.

12. Instructor's Manual, p. 4.

13. Kenneth E. Boulding, "National Images and the International System", in Rosenau, op. cit., p. 425ff.

14. The contention that a map is an important factor in developing interpretations of the world is supported by the fact that of twelve seperate groups trained for simulations at the University of Alberta, the question was raised in nine as to whether a map would be provided. In fourteen personal interviews I conducted with students concerning the usefulness of the map, the most frequent response was that it was helpful as a means to organizing all the data received about other nations.

15. As a further example of introducing points of contention by means of a map, some of the following cases were used at the University of Alberta: an unclaimed island containing newly discovered basic resources; a city under joint administration which represented a loss of validator satisfaction to the nation which withdrew its force commitment; a province in an underdeveloped nation which could provide consumer satisfaction units provided the adequate level of capitalization was attained.

Chapter VI

1. Georg Schwarzenberger, Power Politics: A Study of World Society, (London: Stevens and Sons, Limited, 1964), p. 158.

2. Schelling, Arms and Influence, chpt. II.

3. Quincy Wright (abridged by Louise Leonard Wright), A Study of War, (Chicago: The University of Chicago Press, 1952) pp. 13-14.

4. Participant's Manual, p. 17.

5. See Appendix B.

6. One glaring inaccuracy of the BC formula is the excessive value given to population. This can be easily demonstrated by comparing the formula for a nation like Great Britain (.60 X 40 X 220 = 5,280) with the formula for China (.75 X 600 X 20 = 9,000). The equations indicate that because of her vast population China could produce close to twice as much as Great Britain, yet the respective GNP's of the two do not reflect this. The BC formula can be adjusted to reduce the effects of population. A further revision might be to limit production according to the scarcest available raw material a nation possesses following a suggestion made by John Baldwin, "The Economics of Peace and War: A Simulation", Journal of Conflict Resolution, Vol. XI, #4 (December, 1967), pp. 386-87.

7. For example, in Participant's Manual for Inter-Nation Simulation, (Ohio State University, multilith, 1968), p. 36, the depreciation rates for FCn's range from 40% to 60% as compared to INS's 20%.

8. Presumably for nuclear weapons the dispersal factor is of a slightly different nature than for UC's or P. That is, there is a higher degree of secrecy involved with the whereabouts of nuclear launch sites as well as numerous moving launch points located on submarines, etc.

9. This defect was strikingly demonstrated during experimental runs at the University of Alberta (spring, 1970). The prime experimental intervention was the introduction of a new defense system to one of the nations which would make it invulnerable to nuclear attack. One intention was to observe the behaviour of the relativele "defenseless" nations vis-a-vis the invulnerable country. However, one common response of these "defenseless" nations to such a situation was to step up their conventional defense production and achieve invulnerability themselves - - - a circumstance not readily foreseeable with regard to real nations.

10. Participant's Manual, p. 18, equations 12 and 13 give the present defense capabilities. These can be adjusted. For example, instead of 4 BCdef-n protecting 1 FCn, a more realistic figure may be 10 BCdef-n.

11. Ibid. p. 19.

12. Ibid. p. 35.

13. Developments, p. 114.

14. Instructor's Manual, p. 24. The other two methods of establishing SFA are based on the Director's evaluation or the assessment of a participant(s) appointed for such a task.

15. William L. Shirer, The Rise and Fall of the Third Reich, (Greenwich, Conn.: Fawcett Publications, Inc., 1959), passim.

16. L. F. Richardson, Arms and Security: A Mathematical Study of the Causes and Origins of War, (Pittsburgh: The Boxwood Press, 1960).

17. Karl W. Deutsch, Political Community at the International Level: Problems of Definition and Measurement, (Garden City, N.Y.: Doubleday and Co. Inc., 1954).

18. Amitai Eztioni, Political Unification, (New York: Holt, Rinehart and Winston, Inc., 1965).

19. In case the suggested measurements appear too complex it should be noted that these are calculations done by the Director and do not place additional burdens on the participants nor should such measurements be undertaken without the aid of computers.

20. Such a variable was successfully introduced into exercises conducted by John MacRae and Paul Smoker, "A Vietnam Simulation: A Report on the Canadian/English Joint Project", Journal of Peace Research, Vol. 4, #1 (1967), p. 18. Participants were asked to evaluate other nations and their own on different scales. Without their knowledge the participants' rating of their own nation determined their P. O. The P. O. scale could be determined initially by the Director and adjusted by him in accordance with his evaluation of the historical backgrounds provided for the nations or changed according to his research designs.

21. The designers of INS recognized the "prestige race" conducted by nations in the world and attempted to incorporate such a measurement in their pilot runs. Robert Noeld reports that the attempt was a failure. See Developments, pp. 84-85 and p. 95. However, this failure may have occurred because the exact opinions of each nation were printed. In the Vietnam simulation a similar prestige rating reported as an aggregate opinion of each nation was successful. See MacRae and Smoker loc. cit., p. 17.

22. Wright, op. cit., p. 13; and K. J. Holsti, International Politics: A Framework for Analysis, (Englewood Cliffs: Prentice-Hall Inc., 1967), p. 321.

23. For further reference see F. C. Bartlett, "The Aims of Political Propaganda", in Daniel Katz, Dorwin Cartwright, Samuel Elderwild

and Alfred McClung Lee (eds.); Public Opinion and Propaganda, (New York: The Dryden Press, 1954) pp. 463-70; Harold L. Childs, Public Opinion: Nature, Formulation and Role, (Toronto: D. Van Nostrand Company Ltd., 1965); and Michael Choukas, Propaganda Comes of Age, (Washington: Public Affairs Press, 1965), Chpt. 3.

24. Such a scheme was successfully introduced into the Ohio State University Exercises. See Ohio State Participant's Manual, op. cit., p. 46.

25. Participant's Manual, p. 20.

26. Such a use of FCc's for reconaissance against another nation would not trigger an automatic response if this were the defense plan of the target nation.

27. Holsti, op. cit., p. 323.

28. Instructor's Manual, p. 27.

29. Ibid., p. 21.

30. In the advent that actual fighting occurs between forces of this nature, this would not constitute a state of war between the involved nations and the ten minute war response periods would not be imposed. In such cases only official declarations will bring war procedures into effect.

31. Tuchman, op. cit., pp. 77-78 and pp. 93-95.

32. The objection may be raised that such a procedure seems unduly complex. However the innovation was introduced in an exercise involving grade 12 students who were replicating the outbreak of World War I. These students mastered the procedure with ease.

33. Ohio State Participant's Manual, op. cit. pp. 45-46 introduces such a form. See Appendix A for an illustration of the Blockade form.

34. For example, the effects of mobilization are important in the study of World War I, propaganda played a significant role before World War II, and blockade was crucial in the 1962 Cuban Missile crisis.

Chapter VII

1. Karl Von Clausewitz (translated by D. J. Mattijs Jolles), On War (New York: The Modern Library, Random House Inc., 1943); Hart, op. cit.; or any issue of Military Review (Fort Leavenworth; United States Army Command and General Staff College).

2. During pilot runs at Northwestern University the option of making war was not originally programed. However, it was judged that

the vagueness of the provisions for such action precluded war as a viable option to decision-makers. Consequently an explicit routine was introduced. See Developments, p. 74.

3. Participant's Manual, p. 21.

4. For example, in one exercise that I directed that attempted to replicate the outbreak of World War I, a defect in the rules permited Serbia to attack and defeat Austro-Hungary . . .twice!

5. This propensity to make war may also derive from the lack of suitable alternatives available to participants. The options introduced in the previous chapter will in part alleviate this problem.

6. It is noted that the INS procedure is predicated upon traditional principles of conducting war and does not admit the non-conventional approach that appears in guerilla warfare. However, since guerilla warfare is more often a manifestation of civil rather than international wars, innovations regarding guerilla warfare will be introduced in the chapter dealing with internal control.

7. Holsti, op. cit., pp. 85-86.

8. "NATO Conference on Damage Assessment: Summary Report", (Paris, France, monograph, 1964).

9. Instructor's Manual, pp. 27-29.

10. If each side committed 100 FCc's, the German force would have the effect of 150 FCc's (1.5 X 100) while the Russian force would represent the destructive capability of 75 FCc's (.75 X 100).

11. Halperin, op. cit., p. 38.

12. This would provide a little more security for small nations which need not fully match the strength of potential attackers.

13. Participant's Manual, p. 18.

14. Ibid., p. 22.

15. Wright, op. cit., p. 15.

Chapter VIII

1. Since the focus of INS is on interaction between states the complex domestic processes which occur within a nation are not replicated in full. Such processes are usually reduced to a few probabilistic computations, the results of which are fed into the international system.

2. Instructor's Manual, pp. 24-26.

3. Holsti, op cit., p. 312 (emphasis in the original).

4. For example, see Crane Brinton, The Anatomy of Revolution, (New York: Prentice-Hall, Inc., 1938); Hannah Arendt, On Revolution, (New York: The Viking Press, 1963); Feliks Gross, The Seizure of Political Power in a Century of Revolutions, (New York: Philosophical Library, 1958); and, Andrew C. Janos, The Seizure of Power, (Princeton: Centre of International Studies, Research monograph, #16, 1964).

5. See , for example, Henry Brinen (ed.), The Military Intervenes: Case Studies in Political Development, (New York: Russell Sage Foundation, 1968); John J. Johnson, The Role of the Military in Underdeveloped Countries, (Princeton: Princeton University Press, 1962); and, Edward Luttwak, Coup D'Etat; A Practical Handbook, (New York: Alfred A Knopf, 1969).

6. D. J. Goodspeed, The Conspirators: A Study of the Coup d'Etat, (Toronto: The MacMillan Company of Canada, Ltd., 1962), Chpt. IV.

7. Shirer, op. cit., passim.

8. Developments, p. 131.

9. Instructor's Manual, p. 36. The last cell of Table 5a indicates there is no chance of a successful revolution if FCic is 30%. As an interesting manifestation of this unrealistic feature, one participant confided to me that he purposely kept satisfaction low in his nation but always invested the maximum to internal control. This was the only way he claimed to insure continuation of office.

10. See Samuel B. Griffith (translator) Mao Tse-tung on Guerilla Warfare , (New York: Frederick A Praeger, 1961); and, Charles Thayer, Guerilla, (New York: Harper and Row, 1963).

11. J. C. Wylie, Military Strategy: A General Theory of Power Control, (New Brunswick, N. J.: Rutgers University Press, 1967), pp. 24-25. Warfare can be categorized as "sequential" - - - a series of discrete steps, each step determined by the outcome of the previous step (e.g. the American "island hopping" campaign in the Pacific Theatre) or "cumulative" - - - a collection of lesser, isolated actions (e.g. submarine warfare).

12. Guerrilla warfare was largely used in occupied nations during World War II and has since occurred in more than 15 countries. Holsti, op. cit., p. 335.

13. In new countries where armed services are small a ruler has more opportunity to develop an effective balancing force to the armed services.

14. Participant's Manual, p. 10.

15. Developments, p. 130.

16. For example in some new states the rationale for seizing power is often a disillusionment with the inefficiencies of democratic systems of government. See Fred R. von der Mehden, Politics of the Developing

Nations, (Englewood Cliffs: Prentice-Hall, Inc., 1964), p. 109 ff.

17. See Participant's Manual, p. 35. The values determined by using this table will be lowered in relation to the amount of the DOL's BC investment.

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APPENDIX A

A SAMPLE BLOCKADE FORM

Nation:_____ Year:_____

This blockade goes into effect at:_____Time

Target Nation:_____

Commodity to be blockaded (circle one or more):

BR's UC's CS's FCc's FCn's

Total number of FCc's committed to blockade (note: 30 FCc's per commodity):

_____FCc's

Reminder: All FCc's allocated to a blockade can not be traded, used for attack or put to any other purpose during that period.

Completed by:_____(decision-maker)

Endorsed by:_____(Head of State)

APPENDIX B

MODIFICATIONS TO FCn PRODUCTION

In its present form the INS production formula for FCn's allowed rates of change of total FCn's ranging from 100% to 400% per year during exercises held at the University of Alberta (1967-68). In 1968 a new table was introduced as follows:

BC cost per unit	200	40	10	6	4	2
FCn's at beginning of session	1-5	6-30	31-100	101-250	251-500	501+

This table produced changes ranging from 80% to 320%. In 1969 the table was further revised as follows:

BC cost per unit	200	40	20	10	5	2
FCn's at beginning of session	1-5	6-30	31-100	101-300	301-600	601+

Rates of Change were reduced to 20% to 210% per period. Any further modification to the table could most fruitfully be applied to the last few cells which would have the effect of restraining the rates of change in established nuclear powers.

APPENDIX C

THE REVOLUTION PROCESS

Below is an example of the explicit rules and structure of an active revolution process as proposed in Chapter VIII. Such a scheme was introduced in two exercises conducted at the University of Alberta.

The Coup d'Etat

When VS drops below 6, conditions are created in which the OMA may consider a seizure of the office of the HS. The OMA gains control of a percentage of his nation's total FCc's according to the following schedule:

VS=	% controlled by OMA
5	7
4	14
3	21
2	28
1	35

The OMA may implement a coup by submitting a Force Activation Sheet (FAS) to the Director. All FCc's controlled by the OMA must be activated for this purpose. The Director will inform participant's of the outcome.

Civilian Insurgency

When VS drops below 4, the DOL automatically gains resources which may be invested in the creation of internal conflict. Such resources measured in a percentage of the nation's total BC's, may be aimed at undermining the HS or forcibly seizing office. Thus:

When VS = 3	DOL gets 1% of total BC's
" " = 2	" " 2% " " "
" " = 1	" " 3% " " "

By means of the DOL Decision Form, the DOL will indicate whether he is allocating BC's to lowering the probability of the HS retaining office or to the creation of guerilla forces (FCg's). In the latter case insurgency forces are created according to the following formula:

1 BC = 1 FCg

FCg's accumulate from period to period and any portion may be activated against the government by the registration of a FAS with the Director.

HS's Resistance to Attempts at Seizure of Control

The HS may devote up to 5% of his nation's budget allocations to the creation of Security Capabilities (SC's) according to the following equation:

1 BC = 1 SC

SC's accumulate from period to period and budget allocations may be increased or decreased by 1% per period. The HS is informed of all attempts at seizure of office and will have five minutes to respond by activating any portion of his accumulated SC's (by means of an FAS).

Force Activation Sheet

The FAS would contain the following items:

Decision-Maker ..... HS ..... OMA ..... DOL

Activate: ..... FCg's against HS (DOL vs. HS)

_____ SC's against FCg's (HS vs DOL)
_____ FCc's against FCg's (HS & OMA vs DOL)
_____ FCc's against HS (OMA vs HS)
_____ SC's against FCc's (HS vs OMA)

The number of forces activated is to be designated in the blanks.